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THE Association was organized in Boston, Mass., on June 21, 1882, with the object of providing its members with means of social intercourse and for the exchange of knowledge pertaining to the construction and management of water works. From an original membership of only TWENTY-SEVEN, its growth has prospered until now it includes the names of 900 men. Its membership is divided into six classes, viz.:

A Member shall be an officer or employee of a public or private water works, an engineer, chemist or other person qualified to aid or interested in the advancement of knowledge relative to water works.

An Honorary Member shall be a person of acknowledged eminence in some branch of water supply or of engineering.

A Junior shall be not less than eighteen years nor more than twenty-five years of age, a student or connected with water supply work.

An Associate shall be either a person, firm or corporation engaged in manufacturing or furnishing materials or supplies for the construction or maintenance of water works.

A Corporate Member shall be either a Water Board, Commission, Company or Municipal Corporation.

The initiation fees and annual dues are as follows:

Initiation Fees		*Annual Dues*	
Members	$ 5.00	Members	$ 5.00
Juniors	1.00	Juniors	1.00
Associates	10.00	Associates	10.00
Corporate Members	10.00	Corporate Members	10.00

This Association has at least eight regular meetings each year, of which five are held in Boston, one in northern New England, one in southern New England, and one, the annual convention, held in September or October on such date as the Executive Committee may designate.

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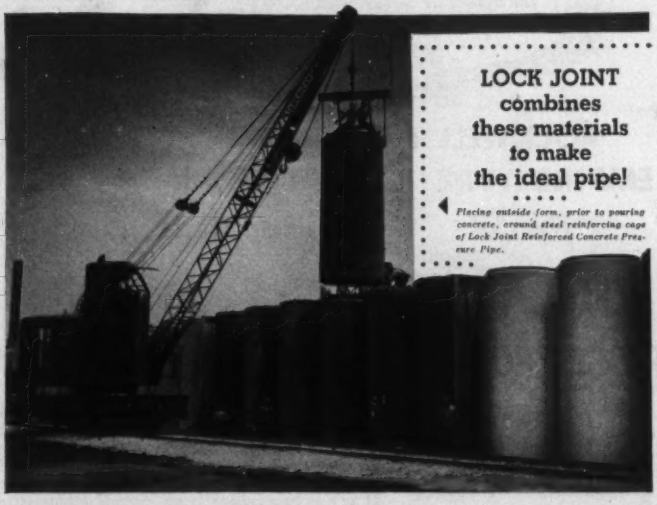

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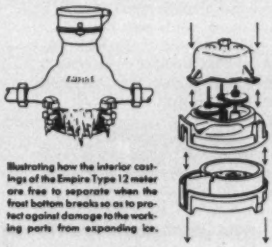

Illustrating how the interior castings of the Empire Type 12 meter are free to separate when the frost bottom breaks so as to protect against damage to the working parts from expanding ice.

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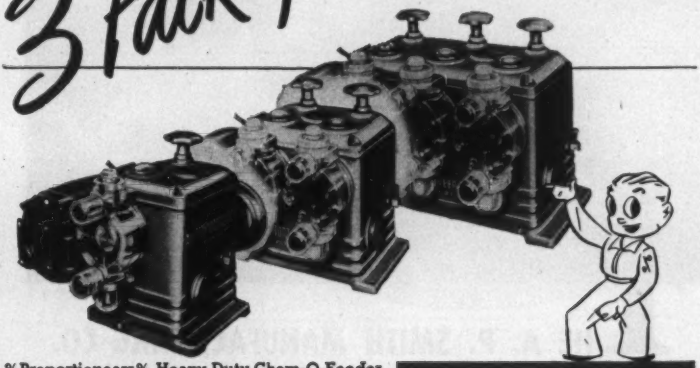

%Proportioneers% Heavy Duty Chem-O-Feeder is built in three basic models, having one, two, or three feeding heads, each of which is adjustable independently. These easy-to-install, easy-to-operate chemical proportioning pumps are specially engineered to simplify water treating work and to provide the utmost in dependability under all operating conditions.

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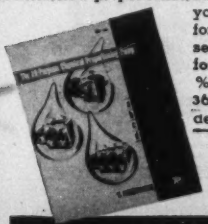

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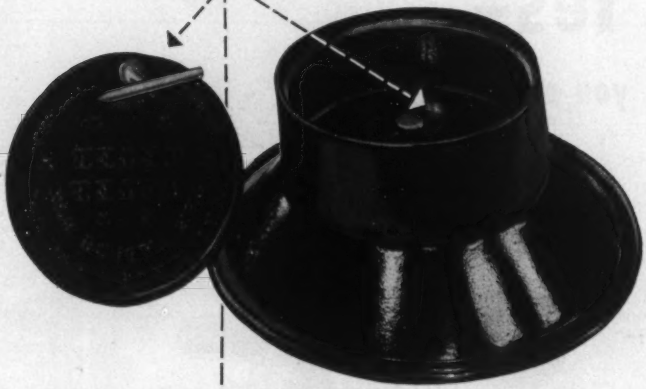

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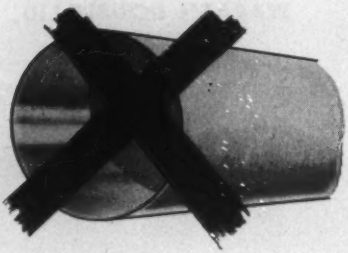

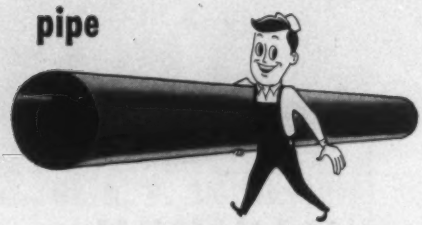

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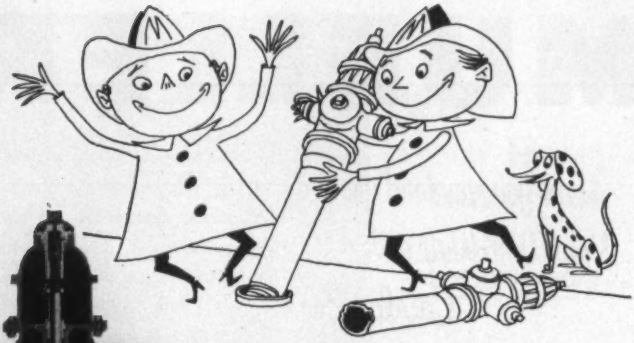

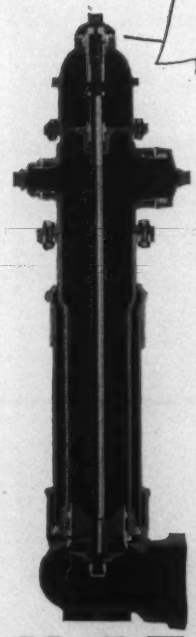

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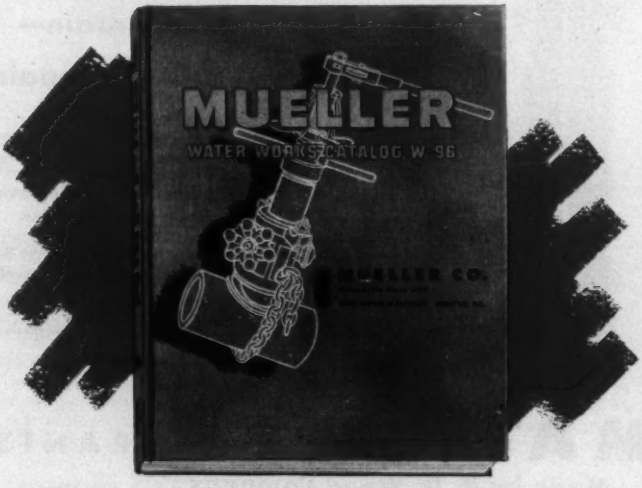

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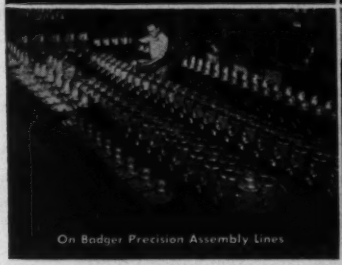
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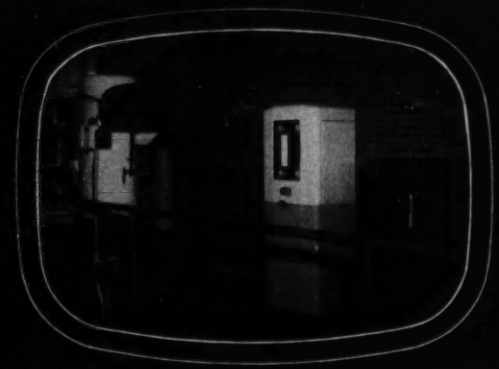

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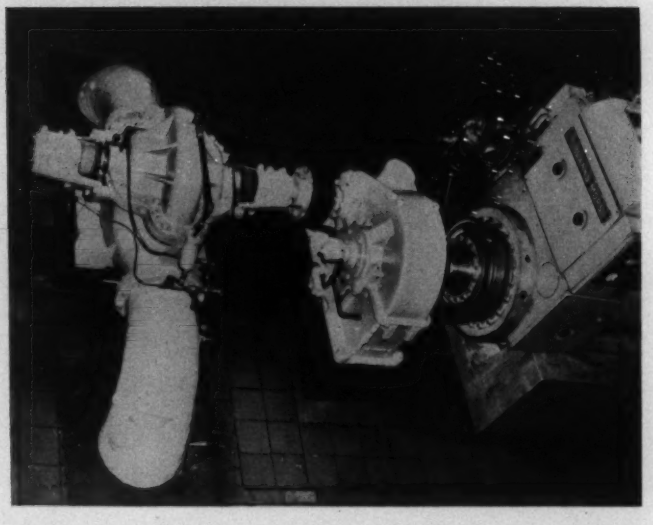

12"x14" Fairbanks, Morse Figure 5814 Pumps

Pictured above is a bird's eye view of one of the two 12" x 14" Fairbanks, Morse Figure 5814 Double Suction Horizontal Split Case Centrifugal Pumps, supplying the Arlington, Arlington Heights and Belmont sections of the Metropolitan District Commission's Water Division.

Each of these two pumps rated at 6000 G.P.M. at 220 TDH is driven by an eight cylinder Model 31A8½ Fairbanks, Morse Diesel Engine.

Installed in early 1953 as part of the MDC's new expansion program, both pumps take suction from the Wachusett Reservoir, Clinton, Massachusetts, distributing main and boost the pressure in the area served.

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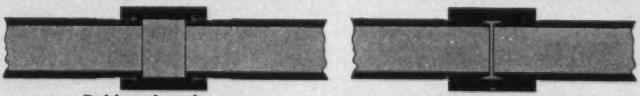
3
This cut-away section shows:
1. Pipe ends automatically separated for flexibility and expansion.
2. Rubber rings compressed for water-tightness.
3. Coupling and pipe made of long-lived corrosion-resistant asbestos-cement Transite.

INSTALLATION OF TRANSITE RING-TITE COUPLING IS SURE, SIMPLE, EASY



A. Rubber rings in groove before assembly

B. Rubber rings compressed after assembly

*NOTE: In the large photograph above, a portion of the Ring-Tite Coupling has been removed to show its design. One rubber ring has been cut to illustrate how it is compressed between pipe and coupling.

Johns-Manville

RING-TITE® Coupling

provides greater economy in pipeline installation

... maximum performance in service

- **Simplifies Transite Pressure Pipe assembly**
- **Reduces installation time**
- **Helps assure tight, flexible joints**

BECAUSE of its unique design, the new Johns-Manville Ring-Tite Coupling provides many money-saving advantages. For example, no complicated equipment is required for line assembly. With tight, flexible Ring-Tite joints easily obtained, the contractor can get in and get out quickly with a substantial saving of time and money.

Ring-Tite Coupling installations can be made under adverse weather, temperature, or terrain conditions. Loose sand, slippery clay, mud and ice do not interrupt pipe assembly nor affect the performance of the completed assembly. Transite Pressure Pipe and Ring-Tite Couplings can be assembled in wet trenches.

Rings automatically positioned and locked in place

Pipes need only rough aligning. The coupling does the rest automatically . . . centers, aligns and adjusts for expansion. Rings are automatically pre-positioned by simply "popping" them into prepared grooves . . . and when the pipe is being pulled, the sliding motion of the rings squeegees all loose foreign material from the end of the pipe.

Each Ring-Tite Coupling is automatically stopped in exactly the correct sealing position to assure maximum water tightness and joint flexibility . . . to permit conformance to curves . . . to withstand shock and vibration . . . to relieve line stresses.

As a long-term investment, Transite Pressure Pipe effects outstanding performance and economies in your water supply and distribution expansion programs. Now the Ring-Tite Coupling brings you equally substantial *installation* economies—*immediate* savings!

For further information, write Johns-Manville, Box 60, New York 16, N.Y.

JM

Here on this 12" New England installation of the Ring-Tite Coupling, the contractor's bid was based on installing 400 feet per working day for the job conditions prevailing. Actual laying time averaged over 700 ft. per day!

TRANSITE PRESSURE PIPE

The Heffernan Press

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THE JOURNAL OF THE NEW ENGLAND WATER WORKS ASSOCIATION
and *other* good publications..

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New England Water Works Association
ORGANIZED 1882

VOL. LXVII DECEMBER, 1953 No. 4

This Association, as a body, is not responsible for the statements or opinions of any of its members

HISTORY AND PROBLEMS OF THE BANGOR WATER DEPARTMENT

BY DONALD P. JOHNSTON*

[*Read November 20, 1952.*]

Bangor's municipal water system, which today is serving over 31,000 people with an average of 4 mgd of water, was established over three-quarters of a century ago by an act of the State Legislature, approved by Governor Dingley, February 22, 1875, and accepted by the people of Bangor on March 8 by a vote of 2,776 "Yeas" to 79 "Nays".

The nucleus of the present plant was built in 1875 at Treat's Falls on the Penobscot River. The first contract for construction was awarded to the Holly Manufacturing Co. July 13, 1875, covering pumps, water wheels, boilers, buildings at the dam, and 76,951 ft of distribution cast-iron pipe, this being later increased by 14,450 ft, much of the original pipe being still in service. Actual construction was begun in July, 1875, with the building of a water-power plant with about 3-mgd capacity, an auxiliary steam pump of about 2.5-mgd capacity, a boiler house and buildings for housing the pumps and water wheels. The water-works dam was also constructed the same year—a timber-crib structure, filled with stone, about 900 ft long and varying in height from 16 to 30 ft. It measured 37 1/2 ft wide across the top and was 80 to 96 ft wide at the bottom. The fish-way near the Brewer shore and the sluice for logs about midway of the river were a part of the original construction. According to an official estimate made in 1877, the dam created a normal power of 4,500 to 8,700 horsepower, according to flowage and tide conditions.

As the city's population increased and water mains were extended, increasingly greater demands were made on the municipal water works. Both plant and service were improved and enlarged from time to time. In 1886-87 a new Gaskell pump of 5-mgd normal

*Superintendent, Water Dept., Bangor, Me.

capacity was installed and an addition built to the pumping station. The city's electric light plant was established at the water works in 1889-90. In 1896-1900 a water-filtration plant, large gate-house, five 60″ wheels and water-power pumping plant of 5-mgd capacity were added.

At present the plant equipment consists of the following:

Low-lift Pumps

1 8-mgd electric
1 8-mgd electric with auxiliary gas engine
1 5-mgd electric

High-lift Pumps

1 2-mgd electric with gas auxiliary
1 4-mgd electric with gas auxiliary
1 7-mgd electric
1 5-mgd, 56-year-old, Deane reciprocating pump, water-wheel-driven
1 350-kw Hydro-electric generator
1 300-kw Hydro-electric generator

We have at present approximately 81 miles of cast-iron pipe, varying in size from 4 to 24 in., connected with a 2-mg standpipe on the east side of the city and a 1 3/4-mg standpipe on the west side. The city is approximately 50% metered at present and we hope to add meters at the rate of 1,200 per year, until we reach approximately 7,000 installations.

The Water Board consists of six members, appointed by the City Council, each member serving for a term of three years. Said Water Board has entire charge of supplying water to all water takers and makes all rules and regulations, subject to the approval of the City Council and the Public Utilities Commission. The Board has entire charge of collection of all rents and dues for water and materials. All money is deposited with the Treasurer of the City of Bangor and credited to the Water Department account, and is drawn out only on the order of the water Board. The Water Board is not able to borrow money without the approval of the City Council.

The Penobscot River, from which Bangor takes its water, has a drainage area of more than 7,000 sq mi above Bangor. It originates in a virgin country of mountains and lakes. However, on its course to the sea it becomes contaminated with mill waste, sewage, etc.

The Bangor Water Department has always been plagued with taste and odor problems, primarily pulp-mill waste. Our present treatment, as it has been for several years, consists of aeration, coagulation, and rapid-sand filters of 8-mgd capacity. The coagulation basin has a capacity of 1.5 mil gal. The following chemicals are added in the treatment process: namely, chlorine, alum, carbon and soda ash. The water is pure, but is not very palatable to the tourist, who will detect taste and odor that will not be noticed by a native.

The Bangor water has been well advertised nationally. An article in the *Saturday Evening Post* described our water as follows:

> "Just downstream from the Hydro's Bangor installation there is another dam which impounds water for the city water works, and, while the water is somewhat less vile than that which Philadelphia drinks, it has a noticeable flavor of rotten sawdust and moose tracks. Incidentally, the water over in Brewer, which is piped in from a spring-fed lake some 13 miles distant, is velvety and delicious."

Bangor might have enjoyed a nice tourist business if the *Post* had gone on to say that a few drops of New England rum, mixed with this concoction of rotten sawdust and moose tracks, makes a most delicious highball.

Some of you are wondering what Bangor is doing to improve this condition. We have tried break-point chlorination and chlorine dioxide, and have reports from consultants on the following:

1. The Upland Pond Plan.
2. The Ranney Well System.
3. The Ozone Plan.
4. The plan to improve the present plant.

One of my jobs in 1934 was to find a new supply of water for the city of Bangor. After some research, a group of ponds—namely, Hatcase, Mountain and Floods, southeast of Bangor—was selected. The lay-out was to use Hatcase for an impounding reservoir, which has an elevation of approximately 438 ft above Bangor and, properly developed with a dam, would store about three months' supply of water for Bangor at the rate of 5 mgd. The plan was to pump from Mountain and Floods to Hatcase and the water would flow from Hatcase by gravity to Bangor through two 24″ cement-lined cast-iron mains. These ponds have a drainage area of about 18 sq mi. After

the cost was determined (approximately $2,250,000), the plan and cost were presented to the Water Board. After due deliberation the Board voted that the report be accepted and placed on file.

In 1945 the matter of a new water supply came up for discussion again. In 1947 the Water Board retained Whiting, Weeks & Stubbs and H. M. Payson & Co. to superintend a complete survey of the lower Penobscot Valley, to determine whether a suitable supply of potable water of satisfactory quality and in sufficient quantity could be brought into the area to furnish all domestic, municipal and industrial needs in Bangor and the surrounding communities. The purpose of the survey was to determine whether or not the procurement of such a supply was feasible from an engineering, financial and legal standpoint.

The Bangor Water Board, Whiting, Weeks & Stubbs, H. M. Payson, etc., unanimously decided to retain the firm of Whitman & Howard to make a complete engineering survey. In connection with the legal phase of the project it was necessary to consider several problems. First, it was of paramount importance that a prominent firm of attorneys located in Bangor be retained, in order that the necessary legislation which would have to be passed by the legislature would be properly sponsored and well prepared, and that the best interests of the Bangor Water Board would be represented in both the House of Representatives and the Senate. In addition, a clear and concise explanation of the project would have to be made to all interested Senators and Representatives. To accomplish this end, the consultants secured the legal services of Messrs. Eaton & Peabody of Bangor. To present the proper type of legislation for this project also necessitated the services of able municipal bond attorneys, experienced in revenue bonds. The firm of Mitchell & Pershing, located in New York, was selected.

Act Creating the Penobscot Valley Water Commission

A bill to create a water supply for Bangor, Brewer, Veazie and Orono was then introduced in the Legislature. The bill in its original form contained certain features which were questioned by various interests, but finally, after extended conferences with the consultants, attorneys and other interested parties, these differences were adjusted and the final bill, which was acceptable to all interested groups, was

passed by both branches of the Legislature and signed by the Governor on May 8, 1947. Some of the pertinent provisions of the bill, entitled "An Act Creating the Penobscot Valley Water Commission", are:

1. Any indebtedness created by the Penobscot Valley Water Commission, hereinafter described as P.V.W.C., shall be payable solely from the revenues derived from the operations of such a facility and shall not constitute a pledge of faith and credit of the State of Maine or any city, town, or district within the State.
2. The Commission, which consists of 5 members, shall be appointed by the Governor, by and with the consent of the council.
3. With the approved vote of the electorate of the municipalities involved, the responsible officials in each city, town, and district in the area will be permitted to enter into long-term contracts with the P.V.W.C. to purchase water from the Commission at wholesale.
4. The P.V.W.C. will have no jurisdiction over the operations of the distribution systems of the participating municipalities.
5. The rates for the participating cities and towns, as well as the financing of this project, are subject to the approval of the Public Utilities Commission of the State of Maine.

A Brief Interpretation of the Engineers' Report

Of prime imprtance was the consideration of each and every body of water located within a 40-mile radius of the city of Bangor as a potential source of supply for this unified project. The Engineers were directed to make a complete survey, both from the ground and from the air, for this territory, utilizing information already available and prepared by the Bangor Water Board, the State Board of Health and the Public Utilities Commission. In this report Messrs. Whitman & Howard, consulting engineers, reported various conclusions, which will be given briefly.

Selection of Site

A group of three ponds (Hatcase, Mountain and Floods) was chosen because of their proximity to the city of Bangor (about 12 miles southeast), their large watershed area of 17.8 sq mi, and the excellent quality of their water, based upon reports made available to us by the Bangor Water Department and the Department of Public

Utilities of the State of Maine. Roughly speaking, the three ponds will have an available storage capacity in excess of 5,000, mil gal. Therefore, the yield from this watershed would be adequate to take care of the present and future consumption of the area for at least 100 years, based upon estimated growth.

Estimate of Costs and General Financial Data

The cost of constructing this system, using Hatcase as an impounding reservoir with two 24" mains from Hatcase to Bangor, provided with connections and the necessary reducing valves for the towns of Veazie, Orono and Brewer, was estimated at $4,500,000. The total cost of debt service, maintenance, and operation of both supply and distribution facilities would be $242,700. This would require an average increase in Bangor water rates of 36.2%. Bangor's share in this proposition would be approximately 75% of the cost.

The Ranney System

For several years the Bangor Water Department had been searching for an underground water supply, doing their own drilling and research with their own crew, covering the areas of Bangor, Old Town, Orono and Veazie, with unsatisfactory results. The Ranney Water Collector Corp. of New York was employed to find a suitable underground water supply for the city of Bangor and in 1947 submitted a preliminary report, covering Old Town, Orono, Veazie and Bangor. The most feasible area was found to be Naugler's Gravel Pit in Veazie, adjacent to the Penobscot River. At this location test holes indicated a gravel bed of medium to coarse sand and gravel, ranging in depth from 15 to 30 ft below groundwater level. The length of the gravel deposit was found to be at least 1,600 ft along the river. From this information it is estimated that a total of at least 8 mgd of water could be obtained from this area with three or more Ranney Collector units. The final report was presented by the Ranney Water Collector Corp. in 1948, based on additional test wells and a pumping test on a 12" well at 700 gal per min from August 18 to August 30, 1948—a period of 12 days. Daily samples of water were examined by the Bangor Water Department. As a result of this further investigation, the Ranney Water Collector Corp. concluded that three collectors, located at intervals of 500 ft along the river, each provided with

about 400 lineal feet of projected slotted-screen pipe, would yield 11 mgd with a draw-down in the ground-water table of 16 ft.

Under date of October 13, 1948, R. M. Leggette, consulting ground-water geologist, made a report to the Water Board in which he estimated the yield of the Naugler Gravel Pit area to be 10.5 mgd with a 40% factor of safety, all based on the computations of the Ranney Corp. records during the pumping test from August 18 to August 30, 1948. Leggette recommended that this area be developed with two or three collectors as necessary to supply 8 mgd. For the future he suggested another collector at the lower end of Naugler Gravel Pit and that a collector in the so-called Meadowbrook area in Bangor be considered at a future date. Leggette did not express an opinion on the chemical or bacteriological quality of the water to be obtained from this area.

The present-day costs of three Ranney collectors, pumping stations, pumping equipment, force mains of the present water-works plant, Venturi meter, valves, electrical work and incidentals are estimated as follows:

> The total cost of the above would be approximately $1,000,000. On the assumption of serial bonds averaging 40 years at 2% interest, the payment for the first year on account of principal and interest would be $45,000. The annual cost of electrical power for pumping water from the Ranney collectors to the present filtration plant would be about $12,500. The labor of heat and light at the Pumping Station is estimated at $5,000 per year; maintenance, depreciation and taxes at $20,000; the saving to present low-lift pumping at approximately $7,500 per year. The net additional cost of the Ranney System would amount to about $75,000 per year. This represents an increased cost of 35% in water rates, based on 1950 revenues, and an increase of 32%, based on estimated 1951 revenues.

The Ozone Plan

The Ozone Process Division of the Welsbach Corp. of Philadelphia installed a mobile pilot plant at the Bangor water-filtration plant in 1947 and experimented with the use of ozone at various stages in the treatment process. The purpose of these experiments was to try to eliminate the unpleasant taste and odors in the distribution system that are now presumably caused by the delayed action of chlorine on the organic matter and chemical wastes not entirely removed in the filtered water. Ozone is an electrically manufactured

gas, O_3, and is a very active form of oxygen. Its function in water treatment would be to oxidize and destroy the organic compounds in the water that cause taste, odor and color. Ozone is also a bactericide. It was found that ozone should be added after coagulation, sedimentation and filtration, to give the best results at a minimum cost. The dosage recommended was from two to three parts per million, with a provision of a maximum of 3.75 ppm at a filtration rate of 8 mgd, the equivalent of 250 lb of ozone per day. At present prices, the complete installation would probably cost $400,000. Depreciation on this equipment should be estimated at $10,000 per year. On the assumption of 20-year serial bonds, bearing interest at 2%, the payment on account of principal and interest for the first year would amount to $28,000, decreasing by $400.00 per year for the twenty years. The total additional cost for ozone treatment would be about $49,000 per year. Based on the 1950 revenues, this represents an increase in water rates of 23%, and for the estimated 1951 revenues, an increase of 21%.

The Plan to Improve the Present Water System

In December, 1944, Weston & Sampson submitted a report covering the following:

1. Addition to the clear-water basin.
2. New pumping station on the west side of State St.
3. Pumping equipment in the new station.
4. Piping connections and appurtenances.

In 1944 the estimated cost of these improvements was $375,000. At present-day prices the cost would be approximately $675,000. The present costs of improvements proposed in 1944 and more adequate coagulation would be about $900,000. For this expenditure the present supplying works would be placed in good condition. Based on $900,000 of serial bonds running 20 years, because of the pumping equipment, and bearing interest at 2%, the payment on account of principal and interest for the first year would be $63,000, decreasing by $900.00 a year. The saving in the cost of operation and maintenance would about balance the additional depreciation on the building and equipment. The increase in water rates, based on the 1950 revenues of $213,000, would be about 30% and, based on estimated 1951 revenues, it would be 27%.

In the course of events, the city of Brewer decided that they wanted a new water supply and developed Hatcase Pond, which gives them an excellent supply.

In 1949 an act to create the Bangor Water District was presented to the Legislature and accepted. This District was to be controlled by six trustees, appointed by the City Council, and was for the purpose of supplying water to the city of Bangor. The District Act was presented to the citizens of Bangor in December, 1949, and was defeated by a vote of about 100.

With Hatcase Pond out of the Upland Pond System, it was necessary for us to change our plans for a pond supply. George Sampson, of Weston & Sampson, was engaged to review the four plans previously mentioned and decide as to the feasibility and best plan for the city of Bangor. Parts of his report are as follows:

"Because the City of Brewer has established an independent water supply and acquired water rights at Hatcase Pond, we have studied an alternate Upland Pond Supply for Bangor, which we believe will be more economical both for construction and operation. The plan is to develop the drainage of Floods Pond, Burnt Pond, Little Burnt Pond, and Snowshoe Pond, which, together with the controlled storage, will supply Bangor with a water of good quality for at least 50 years. By adding Fitts Pond drainage area the supply would be sufficient for 100 years. The development would be as follows:

"1. Construct a dam at the outlet of Floods Pond to raise the water level five feet.

"2. Construct an intake into Floods Pond at the northerly end, pumping station and Engineer's residence.

"3. Lay a 24" force main from the pumping station to Snowshoe Pond, a distance of 13,000 ft.

"4. Construct a dam at the outlet of Snowshoe Pond to raise the water level ten feet.

"5. Two 24" pipe lines from Snowshoe Pond to the Penobscot River, through East Eddington, a total length of pipe of 93,500 ft.

"6. Two 24" bolted joint, cast iron, pipe lines across the Penobscot River in a trench backfilled with concrete.

"7. Two 24" pipe lines from the Penobscot River to State St., a total length of 12,000 ft.

"8. A 24" pipe line along State St. to connect with a 20" main at the present Bangor Water Works, a distance of 8,600 ft.

"9. A 24" pipe line along Mt. Hope Avenue to connect with a 20" main from the Bangor Water Works to Mt. Hope Avenue, a distance of 8,000 ft.

"10. Test borings, construction roads, service roads, cleaning around Floods Pond and Snowshoe Pond, chlorinating building and laboratory at Snowshoe Pond, and incidentals.

"11. Purchase of land and rights of way.

All pipe lines would be cast iron, cement lined and tar coated, and designed for proper working pressure. It is estimated that this lay-out, including Fitts Pond at a later date, would yield a total of 2,432,-000,000 gallons per year, sufficient until the year 2050. The total cost of this job is estimated at, say, $4,000,000."

Estimated Cost of Maintenance and Operation

Based on a water consumption of 5 mgd and on the present charge for electric power by the Bangor Hydro-Electric Co., the annual cost for maintenance and operation for proposed Upland Supply is estimated at $50,000 per year. On the assumption of a construction cost of $4,000,000, paid for by 50-year serial bonds, bearing an interest rate of 2%, the average yearly fixed charges will be $80,000 on account of payment on the principal and $40,000 average interest on the remaining principal; the total average fixed charges would then be $120,000 per year for 50 years. The first year's payment would amount to $160,000, decreasing by $1,600 per year thereafter.

Based on the Annual Report of the Bangor Water Department to the Maine Public Utilities Commission for the year 1950, the cost of water from the Upland Ponds for the first year may be estimated at a total of $340,000. Water revenues for 1950, without public or private fire hydrants, amounted to $213,000. The additional revenue required would be $127,000. This represents an increase in water rates of 60%. Based on estimated water revenues for 1951 of $233,000, not including fire hydrants but with allowance for an increase of 10% in the operation of the distribution system and general expenses as compared with 1950, the increase in water rates would be 50%.

The accompanying table shows Sampson's conclusions on the four systems.

In 1951 it was decided to call on the citizens of Bangor to vote on a Water District the second time. This was defeated by a vote of about 10 to 1. The Water Board has no alternative but to repair the existing plant.

	1	2	3	4
	Upland Pond Plan	Ranney System	Ozone Plan	Improving present system
Construction cost	$4,000,000	$1,000,000	$400,000	$900,000
Fixed charges	160,000	45,000	28,000	63,000
Operation, maintenance and depreciation	180,000	*30,000	*21,000	0
Annual cost	$340,000	*$75,000	*$49,000	*$63,000
Increase in water rates:				
On 1950 revenue	60%	35%	23%	30%
On 1951 revenue	50%	32%	21%	27%
Quality of water	Excellent	Doubtful	Doubtful	Doubtful

*Increase.

REHABILITATION OF THE EXETER, NEW HAMPSHIRE, WATER SYSTEM

BY HORACE L. CLARK*

[*Read November 20, 1952.*]

The town of Exeter is the county seat of Rockingham County, New Hampshire. It is situated 50 miles north of Boston on the western division of the Boston & Maine Railroad. The town lies 10 miles inland from the Atlantic Ocean on the Squamscott River. This river empties into the Atlantic Ocean at Portsmouth and is tidewater as far as Exeter.

Exeter is one of the beautiful New England towns, with many large elms and colonial houses. It was settled in 1636 and has grown slowly to a population of around 6,000. It is the site of the Phillips Exeter Academy, which has an enrollment of 750 boys, and its attractive campus adds much to the beauty of the town.

Industries include the Exeter Manufacturing Co., which has made cotton goods for over 100 years; the Wise Shoe Factory and the Exeter Brass Works.

The Exeter Water System

The Exeter Water Works was constructed by Wheeler and Parks in 1886 and 1887. The pumping station and boiler house was their standard design with a chimney, which flared at the top.

The author was much surprised some years ago to find the same general design in Paris, Ky., and found, on investigation, that it was also a Wheeler plant.

Supply

The original supply was obtained by building a dam across Dearborn Brook near the Portsmouth road and creating an impounding reservoir of 60-mil gal capacity. The safe yield, during an extended drought, was estimated at 300,000 gal per day.

In 1930 the supply was augmented by the installation of eight

*Consulting Engineer, Saco Rd., Alfred, Me.

supply wells and a collecting well at the Skinner Springs, some 3,000 ft northeast of the pumping station. This supply flows by gravity to the clear well at the treatment plant and originally had a safe yield of 125,000 gal per day. This had dropped to 76,000 gal per day in February of 1950, due to the extended drought.

Treatment Plant

In 1906 a treatment plant was installed. This consists of a settling basin with a capacity of 150,000 gal and a rapid-sand filter plant, containing two filters—each 12′ x 16′ in area. From the filters the water flows to a clear well, which was constructed of brick, 40′ in diameter and 25′ to the flow line. The approximate capacity is 180,000 gal. There is also a concrete wash-water tank.

Pumping Station

Suction pipes for the pumps lead from the clear well to the pumping station. This is the original brick building, erected by Wheeler and Parks in 1886 to house the original steam pumps, boilers, etc. It has been remodeled to house the centrifugal pumps.

The pumping equipment consisted of the following:—

1. One 650-gpm Worthington centrifugal pump, direct-connected to a 50-hp General Electric motor designed for a pumping head of 194 ft.

2. One 650-gpm Worthington centrifugal pump, direct-connected to a 60-hp gasoline engine, designed for a head of 195 ft.

3. One 200-gpm centrifugal pump, gear-connected to a Fairbanks-Morse Diesel engine, designed for a head of 205 ft.

There are also the usual appurtenances for priming the pumps, a Bailey meter, gauges, etc.

Standpipe

The only storage in the system was a 220,000-gal wrought-iron standpipe, 25 ft in diameter and 60 ft high, erected in 1886. This is located on the north side of Highland St., which is about one-half mile distant from the pumping station. The top of the standpipe is at elevation 165, which gives a static pressure of 62 1/2 lb at the pumping station when the standpipe is full.

Distribution System

The distribution system consisted of 10.4 miles of cast-iron pipe, from 10-in. to 6-in. in diameter; 0.5 miles of 6-in. cement-asbestos pipe; 3.7 miles of 4-in. cast-iron pipe, and 1.2 miles of 2-in. and small pipes—a total of 15.8 miles.

All pipes 10-in. and 8-in. in diameter, and much of the 6-in. and 4-in., were laid in 1886, when the original system was installed. No large-diameter pipes had since been laid, to improve the fire-protection service or to correct the gradual deterioration in carrying capacity, due to tuberculation.

By constant vigilance and repair of leaks, the unaccounted-for water from July, 1948, to January, 1950, had been only 8%. For the 18 months previous to July, 1948, it averaged 16%, except for the October quarter of 1947, when, due to drought and fires, it was 24%. These figures are very good indeed and show that all possible had been done by the Company to eliminate wastage of water.

Services

As of Jan. 1, 1950, there were 1,272 service connections in the system. Of the services from 3/4 in. to 2 in. in diameter, 61% had been installed or replaced with copper tubing.

Meters

A general metering program was undertaken in 1925 and at present the system is nearly 100% metered. The installation of meters cut the consumption of water drastically and postponed the necessity of seeking additional supply for 15 years. In recent years the consumption of 450,000 gpd has exceeded the pre-metering rate. This is due in part to the installation of modern plumbing, electric dishwashers, washing-machines, automatic hot-water tanks, and such modern conveniences.

Hydrants

There were in 1950, 66 public hydrants, one in the pumping-station yard, and four private hydrants connected to the system.

Fire-Flow Tests

Fire-flow tests were made in 1941, 1949 and 1951 by the New Hampshire Board of Underwriters. Probably due to increased tuber-

culation and corrosion of the pipes and increased use, the amount of water available at the hydrants was considerably less in 1949 than in 1941. No record was found of any tests in 1929 after the mains had been cleaned.

Table 1 shows a comparison of the results of the 1941, 1949 and 1951 tests, and the Underwriters' requirements. It will be noted that the only hydrant in the list, which met the Underwriters' requirements in 1949, was the one at the corner of Portsmouth Ave. and Highland Ave.—directly below the standpipe.

The town of Exeter was therefore in a very precarious position, due to lack of water for fire protection. There was not sufficient water to meet the demands of an ordinary fire and if two had occurred at the same time, the situation would have been disastrous.

When insurance rates were lowered in 1950 in other New Hamp-

TABLE 1.—FIRE-FLOW TESTS—EXETER WATER WORKS, EXETER, N. H.

Location and type of district	Flow at 20 lb (year) 1941	1949	1951	Required flow
1. Portsmouth Ave. at Highland St. — residential	—	1,350	1,140	1,000
2. Front and Water Sts. mercantile	1,010	755	1,400	2,500
3. Front and Court Sts. high value	—	535	1,350	2,500
4. Pine and Court Sts. residential	650	335	1,650	500
5. Front and Elliott Sts. high value	660	400	1,460	2,000
6. Main and Lincoln Sts. light manufacturing	560	275	1,740	1,000
7. Front and R.R. Ave. manufacturing	—	255	3,410	2,000
8. Oak and Forest Sts. residential	—	210	1,020	500
9. Columbus Ave. and Epping Rd. residential	—	170	4,780	500
10. High St. and Drinkwater Rd. residential	88	0	152	500
11. Jady Hill Ave. residential	—	110	237	500

shire towns, the rates in Exeter remained the same—in other words, Exeter was rated two ranks lower, due to the lack of sufficient water available at the hydrants.

Studies and Reports

The history of the Exeter Water Works shows that major improvements had been recommended from time to time since 1899. Major changes, that had been made in the plant, were the construction of a filter plant in 1906, installation of meters in the late 1920s, the addition of the Skinner Springs Supply in 1930, and the replacement of the steam pumps with electrically, gasoline- and diesel-driven pumps. None of these changes had increased the pressure or the amount of water available for fire protection in Exeter and no mains larger than 6 in. in diameter had been laid since the original distribution system was installed in 1886.

In 1899 a committee, appointed to investigate the fire protection in the town, reported at the Town Meeting that "the main pipes were too small and the standpipe too low" and that "the western part of town was not carefully considered when the plant was laid out". They recommended 14-in. supply mains with 10-in. loops, and increasing the height of the standpipe 20 ft.

In 1907 a committee was appointed by the town, which employed Arthur W. Dudley, a hydraulic engineer, to report at the 1908 town meeting with a view to purchasing the Water Works. Dudley likewise reported that "a 12" or better 14" main should extend to the junction of Front and Water Streets from the pumping station and that 10" should be used where 8" is laid and beyond". He also recommended raising the standpipe 30 to 40 ft and constructing an additional standpipe on Washington St.

In 1925 another committee was appointed, which reported to the town meetings of 1926 and 1927. This committee was to investigate the purchase of the Water Works and the necessary improvements. The recommended improvements consisted of a standpipe in the west end and larger mains.

In 1947 the owners of the Exeter Water Works called in Weston & Sampson, Consulting Engineers, to report on methods of improving the flow and pressure in the system. Weston & Sampson recommended, in August, 1949, a 1-mil gal standpipe on Whitely Rd., with

10-in. mains connecting to Front St. and Main St. at the railroad tracks, and a new, gravel-packed well supply.

On December 29, 1947, and January 12, 1948, E. N. Roberts, the then Chief Engineer of the Public Service Commission of New Hampshire, made reports to the Commissioner, which reviewed Weston & Sampson's findings and made some further suggestions. One of these confirmed the recommendation of the 1899 report, to increase the size of the Portsmouth Ave. main.

Unfortunately for the town, except for the few improvements already mentioned, practically none of these recommendations were carried out.

The Exeter Water Works was privately owned. It had passed through several hands and was owned in 1950 by A. L. McDougal, Jr., of Chicago.

The Company was granted a 22½% increase in rates by the New Hampshire Public Service Commission, effective Jan. 1, 1949, with the provision that the Company make improvements in the amount of $23,000, as follows:—

1.—Installation of an altitude valve at the 220,000-gal. standpipe.
2.—Construction of an additional water main along Portsmouth Ave. to the Square.
3.—Sinking test wells on the Haverhill Road.

These were but a small part of the needed improvements, but the owners were unable to finance this amount on the basis of earnings. The Company had requested an increase of 46% in their rates. In December, 1949, the Commission extended the time for starting these improvements to Feb. 15, 1950.

Purchase of System

Due to renewed agitation for the Town to purchase the water system, a committee was appointed to study the question and, in January, 1950, this commitee engaged the writer to make a report and appraisal of the water system. This report was presented to the committee the first of March and the committee reported to the annual town meeting on Mar. 16, 1950. An article in the warrant, authorizing the committee to negotiate the purchase, was passed by a large majority.

Negotiations were entered into with Mr. McDougal, Jr., for purchase of the Company, and on May 5th an agreement was made with him to purchase the plant and facilities for $200,000 plus the cost of any improvements made since Dec. 31, 1949, and the value of the materials and supplies on hand, subject to ratification by a special town meeting. A public hearing was held on June 6th, at which no opposition appeared. The special town meeting was held on June 13th, at which the majority of the voters authorized the purchase and a bond issue of $400,000, to cover the purchase and necessary improvements.

The speed with which the financial and legal aspects of the water project were carried out was amazing and, as far as the author knows, set a record. By June 16th the prospectus had been mailed out to leading investment firms, with a deadline fixed for noon, June 21st.

Seven bids were received and the bond issue was awarded to Smith, Barney & Co. for the entire $400,000. issue at an interest rate of 1.9% on the 30-year serial bonds plus a premium of $3,308.

In the meantime, the bonds were printed and signed on June 28th, funds were received and Mr. McDougal, Jr., was paid on June 30th.

The serial bond issue was set up so that payments of principal and interest did not exceed $17,000 for the first ten years, $19,800 for the second ten years and $19,300 for the last ten years. Payments on principal varied from $9,000 to $17,000 annually.

Estimated operation costs showed that the Water Department would just about break even on the 1950 revenue, but it was later found necessary to increase the rates by 10%.

The publicity given the project by the local newspaper, the *Exeter Newsletter*, and its editor, Harry B. Thayer, Jr., was a very large factor in persuading the public that it was to their advantage for the town to purchase the Water Works.

Improvements

The outbreak of the Korean war and the probable scarcity of materials added to the urgency of starting the improvement program as soon as possible.

The program called for (1) an additional supply, preferably from a gravel-packed well to the south or west of the town; (2) a

1-mil gal standpipe in the west end of the town; (3) mains 10 in. and 12 in. in diameter, to connect the various units and provide adequate fire flow. The top of the new standpipe was to be set at an elevation 40 ft above the top of the old standpipe, in order to increase the pressure throughout the system. Although the general scheme was pretty well decided upon, the details depended upon several factors, such as the location of the gravel-packed well and the standpipe.

Well Supply

A contract was entered into with the Layne-New York Co., Inc., to drive test wells and to install a permanent well and pump of at least 500-gpm capacity. The best location found was on public land in Gilman Park. The permanent gravel-packed well was installed at this location and gave a yield of 500 gpm.

A pump house with concrete foundation, floor and roof, and walls of concrete block and stucco was erected over the well (see Figures 2 and 3). This was made large enough to permit the installation of an auxiliary gasoline engine for emergency drive, if this was found desirable at a later date, and for any necessary chemical-feeding equipment.

The well was put into service in September, 1951.

Standpipe

Under date of July 5, 1950, a contract was signed with the Pittsburgh-Des Moines Steel Co. for furnishing and erecting a 1-mil-gal standpipe—37 ft in diameter by 125 ft high (see Fig. 1). The selection of a site for the standpipe required considerable study. The town site is flat and no outstanding elevation was available in the west end of the town within a reasonable distance of the center. A study of the topographic maps showed that an elevation of 80 was the highest available in the area. This meant that the standpipe should be 125 ft high, to reach elevation 205, or 40 feet above the existing standpipe.

Several sites were considered. One, which had been previously proposed, was now built up and consequently not available The site finally chosen was on the Concord-Manchester road, about a mile and a quarter from the center of the business district. The standpipe was located 300 ft to the north of the road, on a small knoll.

An access road was constructed and the foundation excavated.

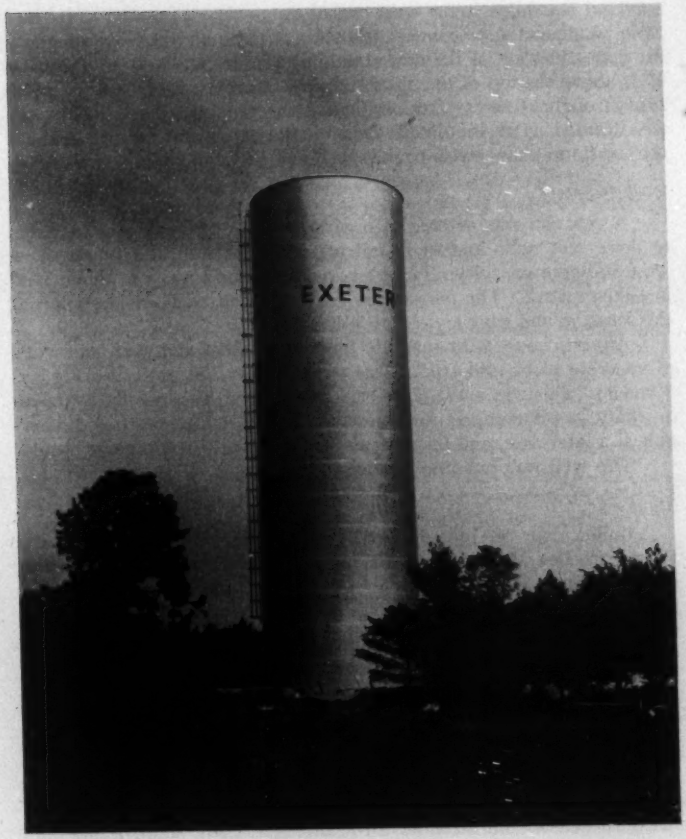


FIG. 1.—NEW STANDPIPE AT EXETER. *A. L. Belcher*

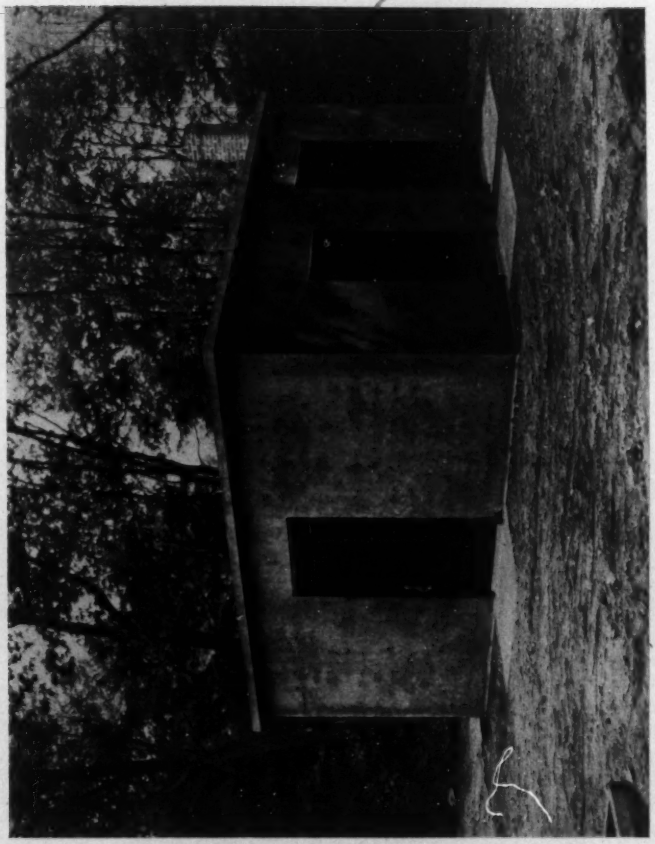
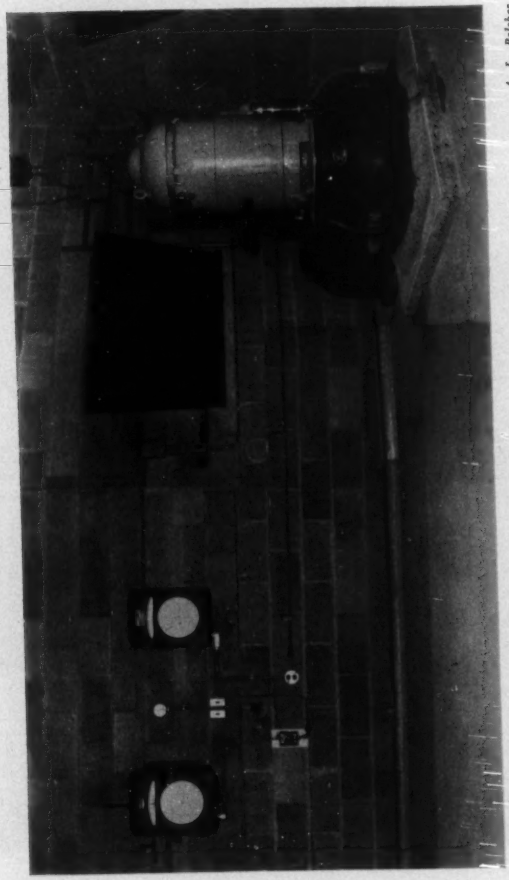


FIG. 2.—GILMAN PARK PUMPING STATION (NOTE STEEL DOORS). *A. L. Belcher*



A. L. Belcher

FIG. 3.—INTERIOR OF GILMAN PARK PUMPING STATION.

Post-auger holes showed a firm hardpan, but as the excavation was carried down, chunks of granite were encountered, projecting up through the hardpan at odd angles. Each time one of these was cut off, a hole was left, so that it was finally decided to pour a subbase of concrete. Fifty cubic yards of concrete were used for this purpose. The main base required 300 cu yd of concrete and 28,548 lb of reinforcing steel. This was poured Nov. 18, 1950, in one continuous operation.

The contract for the foundation and grading was awarded to R. H. White Construction Co., of Auburn, Mass. They sublet the contract to the Lafayette Construction Co., of North Hampton, N. H.

The steel for the standpipe was received in the early part of January, 1951; erection was started on the 17th of the month and finished by April 1st. The paint used had a vinylite synthetic-resin base and gave a very satisfactory appearance.

The standpipe was filled, sterilized, emptied and placed in service in May.

Mains

In addition to the main from Portsmouth Ave. to the Square, which was ordered by the Public Service Commission, it was necessary to connect the well and the standpipe with the existing system.

A 12-in. main was laid from Portsmouth Ave. through a proposed housing development and past the plant of the Exeter Manufacturing Co. to the Square. The advantage of this route was that it increased the fire flow at the Exeter Manufacturing Co.—the Underwriters had been complaining of low flows here for some time—and gave a second crossing over the river.

The well was on the southeast side of town and this was connected by 10-in and 12-in. pipe to Front St. This connected to an 8-in. pipe, which had been laid in the original system as far as the Boston & Maine Railroad track. From the other side of the railroad, a 10-in. pipe was laid to the Manchester-Concord road. A 12-in. pipe was laid along the Manchester-Concord road to the standpipe. Another 10-in. pipe was laid from the junction of the 10-in. and 12-in. over an overhead railroad bridge, to connect with the existing system and reinforce the flow to the business district.

The length of mains laid was 13,470 ft, of which 5,805 ft were 12-in. mains and 7,665 ft were 10-in.

The pipe was cement-lined cast iron, purchased from the Warren Pipe and Foundry Co. The contract for laying the pipe was awarded to the lowest bidder—the R. H. White Construction Co., of Auburn, Mass.

Nine new hydrants were installed on the new lines.

Pumps

Due to the increased pressure in the system, it was necessary to purchase a new gasoline-driven pump for the old pumping station. This was a Worthington pump with a capacity of 700 gpm at a total dynamic head of 250 ft. This with the necessary piping and priming devices was installed in the old pumping station, in place of the small Diesel-driven pump.

Originally it was considered probable that it would be necessary to continue the electrically driven pump in this station as a standby, but permission was obtained from the New Hampshire Board of Fire Underwriters to discontinue the pump and thus save the demand charge. The former gasoline-engine-driven pump is maintained ready to start at any time and, although it is limited as to head, it will serve as a second unit in case of an extraordinarily large demand.

Altitude Valve

An 8-in. altitude valve was installed, to prevent the old 220,000-gal standpipe from overflowing. This was installed on a bypass with gate valves on each side, to permit access for repairs. A 10-in. valve was installed on the main line to the standpipe, as there was none previously. A connection was made to the hospital, on the standpipe side of the altitude valve, to maintain circulation in the standpipe and to assure the hospital an ample supply of water at all times.

Controls

The well pump is operated automatically by a Chronoflo Telemeter system, manufactured by Builders-Providence, Inc. This consists of an instrument at the 1-mil-gal standpipe which transmits the pressure over a leased telephone line to the pumping station in Gilman Park. At the station, a receiving instrument shows the height of water

in the standpipe. When the standpipe height falls 7-ft below the top, a relay is actuated and the pump starts. When the standpipe is full, another relay stops the pump.

An indicating instrument is installed at the office of the Water Department in the Town Hall. This shows the height of the water in the standpipe at all times.

An orifice meter at the pumping station records the flow on another instrument, which shows the rate at which the pump is operating, and furnishes a chart record of the water pumped and the total of all water pumped to date.

With these instruments, the pumping station is fully automatic, requiring attention only for oiling and inspection once a day.

Results

The best criterion of the results obtained by the improvement program is the fire-flow tests conducted by the New Hampshire Board of Fire Underwriters on Nov. 15th. A comparison of the present fire flows and those obtained in 1949 are shown in the following table:—

Location	1949 test	1951 test
Portsmouth Ave.	1,350*	1,140
Water and Front Sts.	755	1,400
Front and Court Sts.	535	1,350
Pine St.	335	1,650
Front and Elliott Sts.	400	1,460
Main and Cass Sts.	275	1,740
Railroad Ave. and Winter St.	255	3,410
Salem and Oak Sts.	210	1,020
Epping Rd. and Columbus Ave.	170	4,780
High St. and Wheelwright Ave.	84 @ 10#	152
Jady Hill Ave.	110	237

Note: All quantities @ 20# residual, unless otherwise noted.
*Pump in old station running at time of test.

The 1951 tests show the fire flow from the Gilman Park pumping station and the Epping Road 1-mil-gal standpipe only. The new gasoline-driven pump at the Portsmouth Avenue station was not running—this pump will deliver 700 gpm when the new standpipe is full. The tests were not of long enough duration to activate the altitude

valve at the 220,000-gal standpipe. This standpipe will furnish 1,200 gpm for a three-hour period at Front and Water Streets.

If these sources were included, the fire flow in the business district would be greatly increased and would meet the Underwriter's requirements. There is now adequate water in the system to fight any fire short of a general conflagration in all areas, except in two dead-end streets.

Due to this increase in fire protection, the New Hampshire Board of Fire Underwriters lowered the fire-insurance rates in Exeter.

This project was carried out under the direction of the Water Commissioners—Herman L. Smith, F. Leroy Junkins and Theodore A. Nowak—and the Selectmen—Joseph G. Morrison, Dean J. Thorpe and John E. Lary.

The coöperation of the Superintendent, George G. Bean, and of the various contractors, previously mentioned, was much appreciated.

THE HUDSON RIVER PUMPING PLANT OF THE CITY OF NEW YORK

BY TORRIS EIDE*

[*Read December 18, 1952.*]

A sequence of circumstances occurring over a period of years had limited the water supply of the city of New York and resulted in an acute shortage in 1949. The Hudson River pumping plant was built to aid in meeting future emergencies until water was available from the Delaware system.

This system consists of two stages and will supply 440 mgd from the Delaware watershed and 100 mgd from the Rondout watershed. The first stage comprises the Rondout reservoir at Lackawack on Rondout Creek—a tributary of the Hudson River—the 85-mile Delaware aqueduct connecting it to Hill View reservoir at the city's northern boundary and the Neversink reservoir on the Neversink River—a tributary of the Delaware River—and the five-mile tunnel connecting the Neversink reservoir with the Rondout reservoir. The second stage comprises the Pepacton reservoir on the East Branch of the Delaware River at Downsville and the 25-mile East Delaware tunnel connecting it with the Rondout reservoir.

The Delaware system was originally planned to be completed about 1940, but, due to litigation instituted before the United States Supreme Court by the State of New Jersey in 1929 and lack of funds because of the depression, work was not started on the first stage until February, 1937. Then because of World War II, work was finally suspended on the Merriman and Neversink dams in the fall of 1943. The Delaware aqueduct tunnel, however, was completed in September, 1943, except for control equipment and minor construction. Construction was resumed on these projects under new contracts in 1946 and began on the Downsville dam in November, 1947, on the Neversink tunnel in December, 1948, and on the East Delaware tunnel in August, 1949.

*Department Engineer, Board of Water Supply, 120 Wall St., New York 5, N. Y.

Impounding in the Rondout reservoir was started in May, 1951, though construction is not yet entirely complete, and it is planned to start impounding in the Neversink reservoir early in 1953, though construction will not be completed until late in 1953. The Downsville dam and East Delaware tunnel are ahead of the schedule requiring completion by the end of 1954.

As an emergency measure, Rondout creek, without any storage, was diverted in April, 1944, into the Delaware aqueduct through a short tunnel connecting with Shaft 1 of the aqueduct. The average annual diversion from 94 sq mi of watershed has been over 96 mgd.

Due to increasing consumption, which had reached an annual average of 1,160 mgd by 1949, and a rainfall deficiency of 8.6 in. in 1949, the storage in the city's reservoirs had dropped to 33.4% of capacity by December 12, 1949, though the reservoirs were full in May. A conservation campaign, started in October, 1949, with the reservoirs about half full, decreased consumption to less than 900 mgd early in 1950. Consumption, however, has been increasing each year since then and will average about 1,120 mgd for 1952.

Based on an investigation of additional sources capable of providing a quickly available emergency supply, begun in 1948, the Board of Water Supply concluded that the Hudson River, where the Delaware aqueduct crosses deep in the rock, about one mile north of Chelsea, N. Y., would provide such a supply and that with super-chlorination before entering the aqueduct, storage of several days in the West Branch and Kensico reservoirs, mixing with six or seven times its volume of upland waters and additional chlorination at two or three points in its passage to the city, 100 mgd of Hudson River water could be safely used as an emergency supply.

The allocation of funds to this project was approved by the Board of Estimate on January 9, 1950, and the State Water Power and Control Commission approved the project on January 28, 1950, but stipulated that the pumping plant should be dismantled by January 1, 1957, unless an extension was granted.

Contract for Pumping Plant

Meanwhile, Contract 427 was prepared for designs—an unusual requirement—and construction and installations necessary to establish at Shaft 6 of the Delaware aqueduct, complete with all equipment

and appurtenances and ready for use, an electrically-operated or a direct-connected Diesel-operated pumping plant, capable of pumping 100 mgd of water from the Hudson River into the Delaware aqueduct against a head of 600 ft, and for the operation of the plant for a period not to exceed four months subsequent to its completion. The contract required that the pumping plant be completed, ready for operation in eight months, and provided for payment to the contractor of $5,000 for each day less than the eight months in which the plant was completed and for liquidated damages for each day over the eight months. Bids were opened on February 20, 1950. There were 17 bidders, the bids ranging from $2,387,000.00 to $5,818,055.00. The costs incurred in securing public utility power for motor-driven pumps, as well as capital and operating costs of both electric and Diesel operation of the pumps, were considered in the choice between the two types of operation. Since the plant was to be dismantled by 1957, capital costs had to be charged off by that time. This favored an electrically-operated plant.

The contract was awarded on March 15 to the Tuller Construction Co. and A. J. Dillenbeck of Red Bank, N. J., in the amount of $2,684,000.

Preliminary plans and information about design, pumps and other equipment, submitted by the bidder, formed the basis on which the contract was awarded. These plans were prepared by Chas. T. Main, Inc., Boston, Mass., who also made the detailed designs under the direction of George R. Rich.

Layout of Pumping Plant

The drainage chamber at Shaft 6 of the Delaware aqueduct, located about 850 ft inshore from the east bank of the Hudson River, is connected to the tunnel, 600 ft below, by a concrete-lined steel riser pipe, 48 in. in diameter. A bronze shaft cap or tee, having two 36-inch outlets closed by bronze gate valves, terminates the riser and so afforded a ready means of pumping into the Delaware aqueduct.

The topography of the city-owned property at Shaft 6, extending along the four-track main line of the New York Central & Hudson River Railroad, determined to a large extent the location and arrangement of the pumping plant. The steep slopes of a rock spoil bank,

placed during the construction of the Delaware aqueduct, necessitated a long narrow structure, placed in the confined area on the flatter ground between the toe of the spoil bank and the property line.

The main features of the plant were specified as consisting of a submerged intake, an intake conduit connecting the intake with the pumping plant, a dilution basin, an overflow and waste drain from the pumping plant to the river, the substructure and superstructure of the pumping plant, a discharge pipe connecting the pumps to Shaft 6, an access road, equipment consisting of pumps, electric motors and an electric substation for electric operation of the pumps, all necessary controls for operating the plant, auxiliary pumps for water-supply and other services, stop shutters, trash racks, traveling screens, sluice gates, check valves, operating mechanisms for gates and valves, pressure regulators and relief valves for controlling pressures in the discharge pipe, cranes, monorails and hoists, chlorinating equipment, a Venturi meter with indicating and recording apparatus, heating, ventilating and plumbing equipment, and other appurtenant structures and equipment necessary for operating the plant. The specifications gave the requirements controlling the design and quality of materials and equipment for these main features, and the performance with which the completed plant must comply, leaving the contractor a fairly wide latitude in the layout and design of the structures and choice of equipment, subject, however, to the approval of the Board's engineers. A plant designed for safe, reliable and economical operation was also required.

The contractor subdivided practically all the work among 34 firms which he considered to be properly qualified and competent to complete quickly the work assigned to them. The contractor, therefore, served chiefly as a coördinator and expediter, and had a project engineer on the job.

River Work

The center of the intake crib is located about 660 ft from the shore line, or 764 ft from the pumping plant, in 54 ft of water, with its top at Elevation —41.0, since the U. S. Engineers required a minimum submergence of 40 ft.

The crib is 20 ft square and 19 ft 6 in. high overall, and is built of 12 x 12-inch No. 1 Douglas fir. The lower 14 ft, to Elevation

—46.5, is a thoroughly cross-braced crib work, the wall timbers of the upper four feet being laid skin to skin. The 16 vertical timbers extend five feet higher and support a framing of 12 x 12-inch timber, on which is placed a solid deck of 6 x 12-inch planking. The five-foot space below the framing supporting the deck is the port area, around the four sides of which are placed removable vertical racks of galvanized wrought iron, the 4 x ½-inch bars being spaced four inches on centers. The net waterway is about 200 sq ft, giving an entrance velocity of about 0.8 ft per sec. An elbow is concreted inside the crib, the entrance, eight feet in diameter, being at Elevation —50.5.

The river bottom was leveled over an area extending 25 ft outside the crib and the silt was removed to a depth of four feet. The excavation was then made about four feet deeper over an area about 30 ft square under the crib. Since the river bottom at the crib and for several hundred feet towards shore was not suitable as a foundation for the crib and intake conduit, piles were driven to a penetration of 20 to 30 ft, giving a supporting power of about 15 tons. Sixteen piles in four bents were driven for the crib, the tops being cut off at Elevation —61.5. The piles were then connected by two 6 x 12-inch stringers bolted to each pile and capped by 12 x 12-inch timbers placed at right angles to the stringers.

The excavation below the top of the foundation was filled with broken stone, after which the crib, weighing 140 tons, was lowered onto the foundation by a floating derrick, divers directing the operation. The crib was built on a barge and towed to the site. Broken stone, sloping up to the bottom of the racks, was placed around the crib over the leveled area and covered with rip-rap.

The intake conduit consists of 72-inch reinforced-concrete pipe, 11.8 ft laying length, complying with the requirements of the Standard Specifications for Reinforced Concrete Culvert Pipe, Extra Strength, A.S.T.M. Designation C76-41. The joint was formed by steel bell-and-spigot rings, welded to the longitudinal reinforcing bars, the joint being sealed with a rubber ring gasket. Divers pulled the pipe together by means of 1½-inch draw bolts, engaging steel anchor lugs at the horizontal diameter.

The conduit was placed on two-pile bents with 12 x 12-inch caps, spaced 11.8 ft on centers, for a distance of about 333 ft from the crib. Inshore, in the firmer ground and in rock, the pipe was placed on pre-

cast concrete sills. The trench in rock extended about 300 ft offshore. Except for about 50 ft next to the crib where, due to the profile of the river bottom, the conduit projected above the bottom, the depth of trench provided a minimum cover of three feet over the top of the conduit. This portion of the conduit was bedded in fine broken stone up to the center of the pipe and the remainder of the trench filled to the original surface with coarse broken stone. The projecting portion near the crib was covered with fine stone to a minimum depth of 2 ft and a minimum base width of 25 ft, a 2-foot layer of rip-rap being placed over the entire area of stone covering the conduit.

Construction Across Tracks

The work across the railroad property, both as to design and construction, was required to comply in all respects to the terms and conditions of the construction agreement made by the Board with the New York Central Railroad. The railroad maintained constant inspection of the work, shifted and replaced the signal wires, and placed and removed the underpinning of the tracks for a 36-inch drain.

The contractor elected to drive a tunnel in rock under the tracks, for the intake conduit. The minimum rock cover over the conduit was about 10 ft under the tracks and the average depth of the conduit below top of rail was about 20 ft. The rock for the first 18 ft was a dolomite limestone and the remainder, Hudson River shale, was badly broken and wet. In order to facilitate progress, the railroad company permitted the use of half a stick of explosive in holes two to three feet long. After each advance of about two feet, a complete ring of liner plates, $\frac{3}{8}$ in. thick, 16 in. long and eight feet in exterior diameter, was erected to assure the safety of the railroad. After an advance of five to six feet, the end of the liner plates was bulkheaded, and the space between the plates and tunnel excavation was grouted, a 1:1 grout being used. The tunnel was driven 114 ft from the building line to a point 10 ft beyond the shore line and bulkheaded. Two skid rails of 2-inch-wide strap iron were secured to the liner places and 14 lengths of 72-inch reinforced-concrete pipe, eight feet long, were pulled into position on these rails. The space between the pipes and liner plates was then grouted with a 1:1 grout. The conduit pipe was

laid in the river trench both from the crib and from the end of the tunnel, and a special section of the pipe was made for closing the gap 175 ft offshore.

A 36-inch reinforced-concrete drain ending in a concrete headwall at the shore line, was placed under the railroad tracks for carrying away the discharge from the unwatering pumps and surge overflow.

Pumping Plant

The minimum river level was taken as elevation —3.0 and a loss of head through the intake conduit as two feet. The minimum depth of flow through the waterways of the pumping plant was fixed at 10 ft, the invert thus being placed at elevation —15.0.

The outside of the substructure at the operating-floor level is 168 x 72 ft. The inlet waterway occupies the northerly 30 ft of the substructure; the dilution basin occupies the middle, with the pump wells at the south end. The intake conduit discharges into a well, equipped with a 72-inch-square sluice gate, permitting the unwatering of the entire substructure, and with grooves for placing stop logs to shut off the intake conduit, so that the sluice gate can be inspected and repaired.

Beyond the sluice-gate well, the inlet waterway widens into three parallel channels, 8 ft 1½ in. wide, each containing a trash rack with a mechanical rake and a traveling screen. Stop-log grooves at the ends permit isolating and unwatering each channel for inspection and repair of racks and screens. Shortly after entering the dilution chamber, the water is chlorinated through a vertical diffusion pipe.

The dilution chamber is divided into seven channels by round-the-end baffle walls and provides a detention period of about seven minutes for a depth of flow of ten feet. These walls are 18 in. thick and 20 ft high, and bear directly on the rock. Four struts, extending the length of the chamber, tie the tops of the baffle walls together.

There are three pump wells, each with two pumps. A 36 x 42-inch sluice gate admits water to each well. Extending for 40 ft from the pump well, an overflow weir, crest at Elevation +7.0, is built into the westerly wall of the dilution chamber. A 36-inch reinforced-concrete pipe connects the weir channel with a drainage manhole ad-

jacent to the sluice-gate wall, from which the 36-inch drain pipe extends under the tracks to the river.

The floor of the substructure, 12 in. thick, is placed on a six-inch layer of gravel and provided with weep holes, to relieve the floor of water pressure when the structure is unwatered.

Substructure walls for ten feet above the floor were concreted against the rock and above this joint were made two feet thick. The space between the wall and the rock was filled with gravel, and weep holes were provided to relieve any water pressure. It was originally intended to concrete only the lower five feet against the rock, but this was increased to ten feet around the entire substructure, because of the poor quality of the rock and also to facilitate the placing and removal of forms. In addition, four concrete buttresses, extending from the walls to the rock, were provided at intervals along the west wall, and three along the south wall.

The poor quality of the rock caused considerable concern for the safety of the railroad. The shale strata dip sharply to the east across the plant site and water entering the joints during heavy rains caused several slides, extending to and beyond the property line. One slide occurred over the tunnel portal. A temporary ten-foot bench was left along the west wall below the slides and subsequently removed after the exacavation reached subgrade. A wall of horizontal 12 x 12-inch timbers, supported on pins set in the rock above the bench and braced with long rakers, was placed for 80 ft adjacent to the tunnel, the back of the timbers sheeted and a lean concrete poured.

The operating floor is U-shaped. The south wing contains the pump room; the central part contains a completely enclosed, fireproof chlorine-tank storage room, with space for 30 one-ton containers and other chlorinating equipment, an office and a locker room, a corridor connecting the two wings. Along the east side of the corridor are several rooms for housing ventilating and electrical equipment, a tool room, toilet and storage space. The north wing contains the operating heads of the racks and screens, the boiler room and other storage space. The floor is at Elevation +15.0, except for the area around the pumps, which is at Elevation +9.0, the lowest elevation considered free from flooding. The open area between the wings is a truck bay with floor at Elevation +11.0. The pump room is serviced by a 15-ton motor operated traveling crane, while the chlorine-

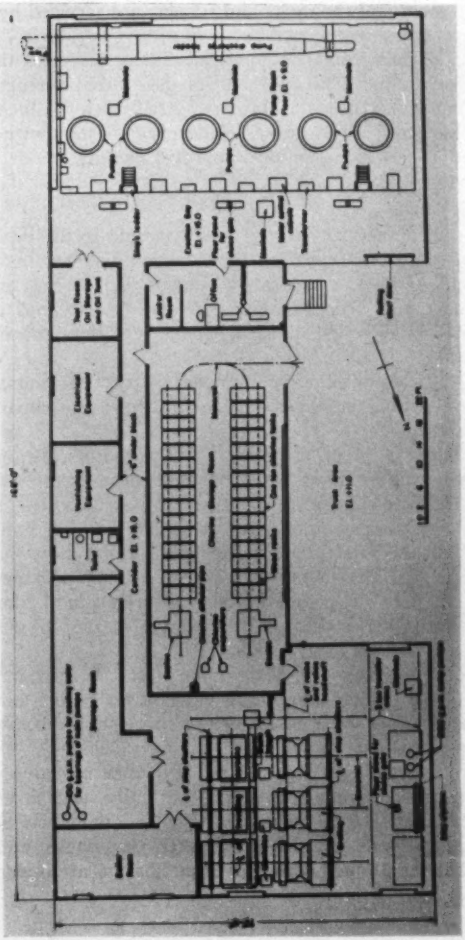


FIG. 1.—PLAN OF HUDSON RIVER PUMPING PLANT.

tank storage room and the racks and screens are serviced by monorail systems.

The superstructure is of semi-permanent construction, with a structural-steel frame. The walls are of galvanized corrugated steel, backed by one-inch-thick insulating board, with ⅛-inch cement-asbestos inside finish. The roof is of corrugated steel with one-inch thick insulation and four-ply tar-and-gravel roofing.

Pumps

The specifications permitted a wide latitude in the design of the pumps. Centrifugal pumps were required, with either horizontal or vertical shafts, designed for a rated head of 575 ft, but suitable for operation under any head between 525 and 625 ft, and each of a capacity equal to 100 mgd divided by one less than the number of pumps installed, at 600 ft head.

The installation adopted comprises six vertical pumps of the deep-well type, with five stages, each pump having a capacity of 20 mgd under a head of 600 ft. The pump bowls are 36 in. in diameter and the discharge is 24 in. in diameter. The motors are of the synchronous type, each rated at 2,500 hp and operating at 900 rpm on three-phase, 60-cycle current at 4,160 volts.

Magnetic starting equipment is provided for each pump motor, designed to limit the maximum current inrush to not more than 10,000 kva. Each unit also has a circuit breaker of 250,000-kva interrupting capacity, with time-delay-undervoltage, overload and short-circuit protection. Each starter has a heavy-duty, start-stop push-button station, with red and green pilot lights.

The connection between each pump and the discharge header contains a 20-inch conical-plug check valve, a tee with a branch containing a ten-inch gate valve and a Pelton surge suppressor, and a 24-inch motor-operated gate valve.

Automatic controls provide a fixed sequence of valve operation when starting and stopping the pumps normally, and in emergency operation when there is a power failure. Before a pump can be started, the following conditions, controlled by electric interlocks, must be fulfilled: (1) that the 36-inch cone valves at Shaft 6 are open; (2) the

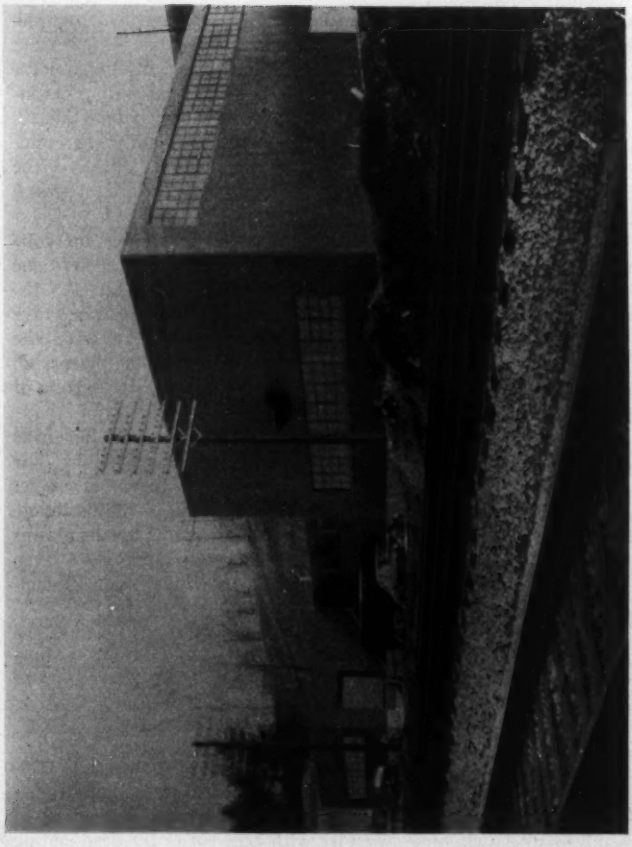


FIG. 2.—EXTERIOR OF PUMPING PLANT.

discharge header is under pressure from the tunnel, the control being by a pressure switch, connected to header; (3) the accumulator tank of the oil system, operating the 20-inch cone valves, is up to pressure and the oil at operating level; (4) the 24-inch pump discharge valve is open. In starting, the motor is brought to full speed and synchronized, an operation which requires about two seconds, before the 20-inch cone valve starts to open, the latter operation requiring two minutes for completion. In closing, when the stop button is pressed, the cone valve closes in two minutes and, when it is closed, a limit switch stops the motor.

In an emergency shut-down due to power failure, all the cone valves close in seven seconds and all the surge suppressors open in one second (they are set to close in 15 seconds), simultaneously disconnecting the motors; due to loss of control voltage, the cone valve and surge suppressor on the affected circuit function and stop the motor; due to electrical failure of motor or starting equipment, all suppressors open in event the line pressure drops below the setting of the pressure switch.

Opening of any surge suppressor will cause its respective cone valve to close in seven seconds and disconnect the pump motor. The surge suppressors are equipped with spring-loaded relief valves, set to open the surge suppressor whenever the pressure in the discharge conduit exceeds 700 ft, and a hydro-pneumatic accumulator maintains sufficient pressure for quick opening of the surge suppressors, even though an abnormal decrease in pressure occurs in the discharge conduit, following an emergency shut-down.

The pressure switch on the discharge header, which operates the surge suppressors when subnormal pressure occurs, is set to open contacts at 157 psi with falling pressure and to close contacts at 174 psi with rising pressure.

Substation

Power for opening the pumping plant is supplied from a 15,000-kva double-ended out-door type substation, with metal-clad transitions and switch gear, installed on a concrete platform. It consists of a galvanized-steel switching structure with accessories for dead-ending three 115,000-volt, 60-cycle, three-phase incoming-line wires and line ground wires; lightning arresters; incoming-line disconnecting switch,

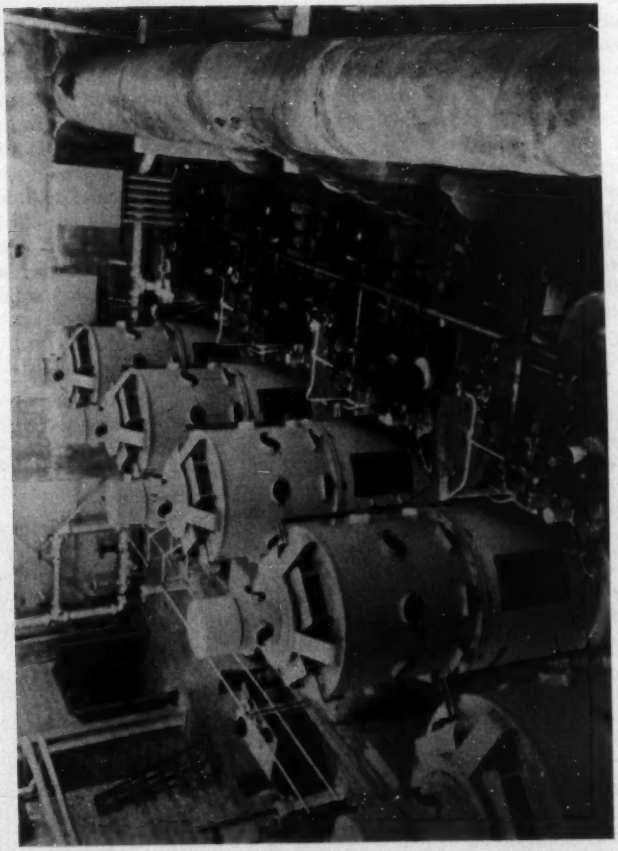


FIG. 3.—INTERIOR OF PUMP ROOM.

interlocked with the primary circuit leader; a grounding switch, mechanically interlocked with the disconnecting switch; a three-pole primary oil circuit breaker of 3,500,000-kva interrupting capacity; two transformer disconnect switches; two three-phase, oil-insulated, self-cooled power transformers, rated 7,500-kva continuous, with gas-oil seal, 115,000 volts to 4,160 volts, designed to operate in parallel with equal load; two secondary air circuit breakers of 250,000-kva interrupting capacity at motor-voltage, with inverse time-overload trip relays; two bus-sectionalizing air circuit breakers, interlocked with the secondary circuit breakers; a station-service transformer, oil-insulated, self-cooled, 112-kva, three-phase, 60-cycle, 4,160V/120-208 volts, and a circuit breaker of 250,000-kva interrupting capacity, for protection of this transformer. A 125-volt storage battery furnishes control power.

Discharge Header and Conduit

The discharge header in the pump room varies from 24 to 54 in., the diameter of the discharge conduit. The discharge conduit rises steeply from the pumping plant 60 ft to a summit air valve, then slopes to Shaft 6. Concrete anchorages hold the bends at the bottom and top of this rise. A third anchorage was provided around the two 90° vertical bends, outside the Shaft 6 drainage chamber.

The discharge pipe is ¾ in. thick and is made of Grade B firebox steel, A.S.T.M. Serial Designation A285-46. The design and fabrication of the conduit conformed to the appropriate paragraphs of the Unfired Pressure Vessels Code, 1950 Edition, of the American Society of Mechanical Engineers, as regards preparation of plates, welding, stress-relieving, radiographic examination, hydrostatic test and thickness of shell, based on a maximum working stress of 11,000 psi and a pressure head of 650 ft. Except for specials, the pipe was fabricated in 40-foot lengths and the field joints were welded, except for three joints provided with Dresser sleeve-type couplings. The pipe was coated with bitumastic enamel and the outside coating covered with a bonded asbestos wrapper. The pipe was laid on an eight-inch bed of sand, in a trench of sufficient depth to provide at least three-foot cover over the conduit. Before backfilling the trench, the conduit was completely covered with at least nine inches of sand.

The conduit enters Shaft 6 drainage chamber from the east, in

line with the shaft cap, and divides into two 36-inch branches, one connecting to the east outlet of the shaft cap and the other looping around and connecting to the west outlet. Each branch has a 36-inch conical check valve for emergency closure, in case of a sizable break in the discharge conduit, and a 16-inch line from the first branch, connecting with an existing stilling chamber, contains a gate valve and a pressure-relief valve for pressure control and surge suppression. The cone check-valves are operated by hydraulic pressure, oil being the medium.

A pitot-tube control will close these check valves in fifteen seconds, if the reverse flow in the conduit exceeds 10 fps, and if the resulting pressure in the shaft cap and riser exceeds 650 ft, a pressure switch will automatically open the pressure-relief valve. The dash pot in this valve is arranged to close the valve in 15 seconds, when the pressure drops to normal, and a limit switch, connected to an indicator lamp in the pump room, indicates if these valves are closed.

The two 36-inch cone check-valves can only be opened by hand valves in the oil line and can be closed from the pump room by a push button, thus enabling the operator to close them for reverse flows in the discharge conduit of less than 10 fps. Limit switches on these valves will prevent starting of any pump if either valve is closed.

A five-inch line, connecting the top of the shaft cap and the discharge conduit and controlled by a hand-operated valve, is provided for filling the conduit initially.

A 12-foot-wide, bituminous macadam access road, about 1,775 ft long, has been constructed from Shaft 6 to the truck area on the river side of the pumping plant. Grades were limited to 7%

The pumping plant was ready for operation and testing on November 6, 1950. Various defects or troubles developed early in these tests and required some time to remedy. The guide bearings of the shafts were not receiving sufficient lubrication; the main thrust bearings of the spring-plate type, built into the motors, were overloaded because of excessive upthrust from the pumps, and the pump bowls of the two upper stages developed weaknesses. After satisfactorily correcting these defects, it was demonstrated that the plant would deliver the required 100 mgd under 600 ft head. The plant was then operated for several months by the contractor, as required by the contract, during which period various tests were made to determine that

all control mechanisms and equipment would function properly, necessary adjustments being made. Since the supply from this source was not needed, pumping into the Delaware aqueduct was done only as necessary for test purposes, during which time the water was chlorinated at the rate of 50 lb per mil gal. Otherwise, the water was pumped back to the river through the 36-inch blow-off line at Shaft 6.

With the completion of operation by the contractor on May 1, 1951, the plant was put in standby condition and has since then been operated bi-weekly. Each pump is operated for one hour, pumping into the tunnel. Only some minor troubles, usually readily corrected by the maintenance crew, have occurred during these runs.

The specifications stated that the power in-put should be determined from the indicating watt-meter on the motor-starter panel, with 2% deducted for power-line losses. The overall efficiency, when tested after attaining steady operating temperatures, was required to be not less than 75%, with the total head on the pumps between 550 and 600 ft. The efficiencies on this basis varied for the individual pumps from 80.5 and 87.6%.

All construction work on the Delaware project is under the direct charge of the Board of Water Supply, the commissioners being Irving V. A. Huie, President, Rufus E. McGahen and Edward C. Maguire. The late John M. Fitzgerald was Chief Engineer during the construction of the Hudson River pumping plant. Walter J. Gress, Senior Designing Engineer, and Frederick G. Switzer, Mechanical Engineer, were in charge of checking and reviewing the designs and equipment submitted by the contractor.

PROCEEDINGS

SEVENTY-SECOND ANNUAL CONVENTION
POLAND SPRING, ME.
SEPTEMBER 28-30, 1953

The Seventy-Second Annual Convention of the New England Water Works Association was held at the Poland Spring House, Poland Spring, Me., on September 28, 29 and 30, 1953.

MONDAY, SEPTEMBER 28

Morning Session

President Stanley M. Dore in the Chair.

The Annual Reports of the Secretary, Treasurer, Editor, Finance Committee, Membership Committee, Library Committee, Committee on Committees, Committee on Legislation and Committee on Reciprocal Relations with the Institution of Water Engineers were presented and accepted.

The President declared the polls closed and appointed as tellers Marshall S. Wellington, Chairman, Kenneth F. Knowlton and Emery S. Littlefield.

The following reports of technical committees were presented and accepted: Committee on Survey of Ground Water Supplies in New England, Committee on Rainfall and Yield of Drainage Areas, Committee on Specifications for Cast Iron Pipe and Fittings, Committee on Reinforced Concrete Pressure Pipe, Committee on Laying Cast-Iron Water Mains, Committee on Specifications for Steel Pipe, Committee on Standardization of Pipe Flanges and Fittings, Committee on Fluid Permeability, Committee on Water Rate Schedules, Committee on Conservation, Development and Utilization of Water Resources, Committee on Cost Data for Water Mains and Services, and Committee on Publicity. The report of the Committee on Recreational Use of Public Water Supplies was also presented. All the reports mentioned above are printed in this issue of the JOURNAL.

Afternoon Session

A paper on "Improvements in 1951 to the Storage Reservoir of the Kennebec Water District" was read by J. Elliott Hale, Superintendent, Kennebec Water District, Waterville, Me.

A paper on "Portland's New Sebago Lake Intake and Supply Conduit" was read by Herman Burgi, Jr., General Manager and Treasurer, Portland Water District, Portland, Me.

A paper on "Mineral Characteristics of Maine Public Water Supplies" was read by R. W. MacDonald, State Department of Health and Welfare, Augusta, Me.

Evening

A real, old-fashioned, gala Harvest Barn Dance, amid rural atmosphere, with favors, fun and refreshments, was held in the Playhouse. This event was sponsored by the Water and Sewage Works Manufacturers Association.

TUESDAY, SEPTEMBER 29

Morning Session

A paper on "Manufacture of Plastic Pipe" was read by Brigham Britton for Carlon Products, Cleveland, Ohio.

A paper on "Experience with Plastic Service Pipe" was read by Allen M. Symonds, General Engineering & Construction Co., Boston, Mass.

Evening

The New England Water Works Association presented, in the dining-room of the hotel, a variety of top-flight entertainers in the arts of comedy, music, prestidigitation and Terpsichore.

WEDNESDAY, SEPTEMBER 30

Morning Session

A paper on "Reorganization of the Lawrence, Mass., Experiment Station" was read by Clarence I. Sterling, Jr., Chief Engineer, Massachusetts Department of Public Health, Boston, Mass.

A paper on "New York's Quest for Interstate Water" was read by Karl R. Kennison, Chief Engineer, Board of Water Supply, New York, N. Y.

A paper on "An Investigation of Continuous Recording of Fluoride Concentration in Water" was read by Kenneth F. Knowlton, Superintendent-Chemist, Salem and Beverly Water Supply Board, Beverly, Mass.

Afternoon Session

A paper, "Domestic and Industrial Water Supplies Face Pollution Problems", was read by Malcolm Pirnie, New York, N. Y.

A paper on "The Significance of the Coliform Test in Relation to Intestinal Virus Pollution of Water" was read by F. Wellington Gilcreas, Division of Laboratory and Research, State Department of Health, Albany, N. Y.

A colored film, "The Mascoma Speaks," produced by the New Hampshire Water Pollution Commission, depicting water uses on the Mascoma River, was shown.

Evening

A social hour in the ball-room, followed by the Manufacturers' Dinner in the main dining-room, was sponsored by the Water and Sewage Works Manufacturers Association.

AWARD OF THE DEXTER BRACKETT MEMORIAL MEDAL

PRESIDENT DORE. I shall now ask Mr. Harold Scales to make the presentation of the Dexter Brackett Memorial Medal for 1952.

HAROLD B. SCALES. Mr. President and members of the New England Water Works Association: Mr. Ellis Tarlton, who is chairman of the Dexter Brackett Memorial Award Committee, could not be present this evening to make the award, as he was just recently discharged from the Lahey Clinic and is convalescing. He, therefore, asked me if I would do the honors for him, and I am very happy to have the privilege to do so.

The Dexter Brackett Memorial Medal was established by the New England Water Works Association 37 years ago, to honor and perpetuate the memory of a man who for many years contributed much to the water-works profession. Early in his career Dexter Brackett was connected with the Boston Water Department and later with the Metropolitan Water System. With the latter organization he served as chief of the distribution system and later as chief engineer. He was president of our Association for the years 1889 and 1890, and for several years was editor of our JOURNAL.

Your committee, consisting of Ellis A. Tarlton of Danbury, Conn., Francis M. Hennessy of Northampton, Mass., and Harold B. Scales of Portland, Me., were of the opinion that the most meritorious paper published in the JOURNAL in 1952 was "Recent Construction by the Portland Water District," by Herman Burgi, Jr., Treasurer and General Manager of the Portland Water District.

Mr. Burgi was graduated from Columbia University in 1913 with a degree in Electrical Engineering and shortly afterwards went to work for the Cumberland County Power & Light Co., which later was taken over by the Central Maine Power Co. In 1926 he went to work for Consumers Water Co., operators of water utilities from Maine to Colorado, as engineer in charge of operation and construction, which included the construction of pumping stations, transmission lines and purification plants, one of his largest projects being the construction of the Springfield, Mo., filter plant. In 1948 he resigned

this position to become treasurer and general manager of the Portland Water District.

Mr. Burgi, on behalf of the New England Water Works Association it gives me a great deal of pleasure to present to you the Dexter Brackett Memorial Award for 1952. May I convey my own personal congratulations?

HERMAN BURGI, JR. Thank you, Mr. Scales. I don't know where you got all the information about me, but it is somewhat correct. However, I was agreeably surprised when I received a letter from Joe Knox, stating that I had been the recipient of the award for last year. All I can say is that I thank the Association very much for giving me that great honor. I thank you.

COMMEMORATIVE AWARD

PRESIDENT DORE. We now have the presentation of the Commemorative Award. As you know, this award was established in 1949 in memory of members who have been prominent in several fields of the water-works profession. Its purpose is to give due recognition to the paper judged next in merit to that of the Dexter Brackett Memorial Award.

This year the award is made in memory of William T. Sedgwick. Professor Sedgwick was noted as a writer, having contributed ten articles to the JOURNAL of this Association. He was a teacher of biological science, an interpreter of the laws of health, a counselor of state and industry, an eloquent lecturer on sanitary science. He became a member of this Association in 1890, was elected to honorary membership in 1904, and served as its president in 1906.

This year the award is made to William A. Healy, Director of the Division of Sanitary Engineering of the State of New Hampshire, for his paper entitled "Sanitary Control of Surface Water Supplies." Mr. Healy.

WILLIAM A. HEALY. Thank you very much, Mr. President. I actually had a long paper prepared here this evening, but I don't think I can make it. I appreciate very much the fact that the committee thought my paper worth while and that they decided to give me this award. Thank you very much.

* * * *

PRESIDENT DORE. In keeping with the custom inaugurated several years ago, it is my privilege to present award certificates to those who have served the same municipality for 25 years and who have been members of this Association for the same length of time. There is only one recipient present. I shall name them and ask that the representative of Mr. Frank P. Morse come forward and receive the award for him. The members to whom these awards are due and to whom the certificates will be mailed are Mr. Thurman W. Dix, Barre, Vt., Mr. Thomas E. Sears of Braintree, Mass., and Mr. Brenton W. Vaughan of Everett, Mass. Also Mr. Frank P. Morse of Salem, Mass.

I should like now to call on Mr. Marshall Wellington, chairman of the tellers, for the report on the election.

REPORT OF THE TELLERS OF ELECTION

September 30, 1953

To the New England Water Works Association:

FOR PRESIDENT	William B. Duffy	343
FOR VICE-PRESIDENT:	Allan F. McAlary	335
FOR DIRECTOR:	Fred P. Stradling	341
FOR TREASURER:	William P. Melley	343

Respectfully submitted,
KENNETH F. KNOWLTON
EMERY S. LITTLEFIELD
(*Signed*) MARSHALL S. WELLINGTON, *Chairman.*

PRESIDENT DORE. I thank the committee very much. Members of the Association, you have elected as President, Mr. William B. Duffy; as Vice-President, Mr. Allan F. McAlary; for Director, Mr. Fred P. Stradling; and for Treasurer, Mr. William P. Melley.

* * * *

Secretary Knox announced the election by the Executive Committee of the following members:

Arthur Ayotte, Clerk of Water Board, Bellingham, Mass.; Russell D. Bartlett, Assistant Division Manager, New England Division, American Water Works Service Co., Inc., Skowhegan, Me.; Charles E. Cannon, Engineer, Metcalf & Eddy, Boston, Mass.; Edward S. Holland, Assistant Engineer, Coffin & Richardson, Boston, Mass; Charles G. Hammann, Director of Public Works, Woonsocket, R. I.; Clarence W. Metcalf, Health Education, Sanitary Engineering Division, Concord, N. H.; Addison P. Munroe, Resident Engineer, Coffin & Richardson, Boston, Mass.; Richard G. Pike, Treasurer, Pennichuck Water Works, Nashua, N. H.; Paige B. Rand, Manager, Damariscotta-Newcastle Water Co. and Wiscasset Water Co., Damariscotta, Me.; Homer R. Stickney, Public Utilities Engineer, Division of Public Utilities, State of Rhode Island, Providence, R. I; Robert T. Symonds, Manager, Milford Water Co., Milford, Mass.; Thomas B. Williams, Jr., Assistant Superintendent, Taunton Water Works, Taunton, Mass.

PRESIDENT DORE. I should like now, ladies and gentlemen, to present to you the President of the New England Water Works Association, Mr. William B. Duffy.

WILLIAM B. DUFFY. Members of the New England Water Works Association, I wish to thank each and every one of you who has shown his confidence in me by electing me as President of this Association. I appreciate the honor of following in the footsteps of such distinguished and outstanding men in the various branches of the water-works profession who have carried on the affairs of this Association since 1882.

The burden of carrying on and supervising the affairs of the Association is considerably relieved by the work of our very able Secretary, Joseph C. Knox, and his very able assistant, Mrs. Melrose. The financial affairs of our Association are in very able hands also, and Bill Melley does an excellent job.

With the assistance of the Executive Committee I shall do my best to promote the interests of the Association in the advancement of knowledge relating to water works and water supplies. I thank you.

As my first duty as your new president I am privileged to introduce to you now Stanley Dore, who will give a presidential address for the past year.

PRESIDENTIAL ADDRESS

By STANLEY M. DORE

This is our 72nd Annual Convention. Our membership stands at 1,083, resulting, in my opinion, from three factors: (1) the energetic work of our membership committee under the leadership of George Coffin; (2) the excellence of the technical programs, carefully, thoughtfully and painstakingly prepared by our committee, of which Fred Smith is Chairman; and (3) the desirability of belonging to a well-run water-works association such as ours. Everyone here knows that, although it is nominally run by your executive committee and officers, it really is captained, sailed and steered by your Secretary, Joe Knox, and his assistant, Mrs. Melrose. I think both of them will agree that this year, in keeping with the precedents of other years, we had a very co-operative and able group of committees and chairmen, with harmony and accomplishments at a peak, and we expect it to continue that way.

The annual report of our treasurer shows that we are not living quite within our income with the present rate of dues, but the feeling of your finance committee and officers is, and has been, that the Society would prefer to encourage membership, particularly of the young men, rather than to raise these dues to a level where we would run at a profit, so long as there is no substantial impairment of the financial reserves that the Society has accumulated over many years in the past. The day for adjustment may be necessary sometime, but the problem is not immediate, because for the past several years we almost "broke even" on the average and the necessity for adjustment is not as important now as the aim of the Society, which is to be of service to the water-works profession in the largest possible degree. A businessman stated that he lost money on every sale he made, but when he was asked how he managed to stay in business on that basis he replied, "It would be impossible if it were not for the large volume of business I do." This is not quite parallel to the situation in the Society because, while it operates at a slight per-capita loss, I believe everyone recognizes the fact that we are continually strengthening

our membership, our reputation and our ability for service—which considerations will stand us in good stead on any such future day that adjustment becomes of greater import than during the past few years.

The Society's membership is made up of old men and youngsters —those under 45 will agree that all those over 45 are old men, and all those over 45 are sure those under are youngsters. The older segment is sure we are living in an age of "cock-eyed" financing anyway, such as old-age pensions, income-tax rulings, pump priming, farm aid, crop destruction, or what have you. The younger segment sees nothing particularly strange about the country's financial conditions with health, social-security and employment benefits. Conciliatory with such divergent views, it seems to me, whether one is under or over 45, as far as the New England Water Works Association is concerned, it can best be preserved by building its membership for the airing, discussing, and even arguing of these different views, especially as they affect water-supply operation and design, and, to do so to the best advantage, the Association must interest, primarily, the water-works operators and engineers of tomorrow in membership and active participation in the affairs of this Society.

The older group thinks we are heading toward a chaotic financial condition and the younger element feels conditions are beginning to get "streamlined" finally. So let us in this Association discuss each viewpoint with hope of material benefit in the viewpoints of each.

A certain advertisement read, "Do you know what becomes of your money?" "Certainly," says the young man before he is married and on a so-called budget, within which it is entirely improper and old-fashioned to live, "Most of it I spend before I get it, and the rest I spend right afterward." And many want to assure this young man and encourage him into the marital status, with the "red ink" budget, by stating that two can live absolutely as cheaply as one, provided, of course, that one is a vegetarian and the other is a nudist on a diet!

In contradiction to the above "reasoning," in order to ridicule the opposite financial slant, if you slave, save and scrimp to save enough money to get married, you will find that you never can afford it; so, pessimistically, you can work your head off at a job you don't enjoy, in a place you don't like, trying to save money you can't keep anyway, in order to spend your declining years in idle boredom that

you can't stand, in some place that you don't like half as well as the place in which you have been working.

If we all—both groups—are agreed that the Society's future success lies primarily with the younger group and the manner in which it matures, and as this younger group constantly ages, so that every year young men reaching 45 suddenly become old men, the best understanding of how to get together on these matters seems to be for all of us to put ourselves in the viewpoint of the very youngest of our prospective members. Child psychology might be wonderful if you could just get the children to understand it. The younger prospective member, nearing completion of his education, takes for granted certain financial regulations which seem entirely unsound to us "grandpas."

For example, a young college student reasons as follows: "I should like to work during the vacation this summer and earn money for something I want badly, and I am sure I need desperately, and jobs are plentiful and people well paid, but if I work too diligently or too long, I shall earn so much that Uncle Sam will not refund the income-tax deductions at the end of the year, and so I shall be penalized. In addition, but not nearly so important a consideration, my parents cannot claim deduction for me as a dependent in such a case, and I understand that it will be cheaper for them if I work only a certain portion of the summer and they buy me some of the things I need anyway. So maybe I shouldn't worry too much about working this summer, but instead take a long vacation, which I could enjoy immensely if I only had some money to spend on it. Of course, if I had saved some in the past, I could do that and maybe that would be a good idea to foster in connection with some future summer vacation, but how can I earn enough to save enough to accomplish this end without a penalty which would offset the saving? Oh, well, I guess the answer must be old-age pensions or social security and so such a vacation is only something to look forward to, and it must be a great thing because nearly everyone contributes to social security."

Upon graduation, this individual starts his career, let us say, in water-works design, construction or operation. It has been my experience that applicants for positions seem to be more interested in the pension plan and security benefits connected with the prospective job

than in any other single feature. Should not these individuals be able to exchange viewpoints with members of our Society, who have been at work for five, ten, twenty or more years?

Let us look at a man a few years out of college, married and with responsibilities falling upon his shoulders like snowflakes. About the time when he thinks he can make both ends meet his wife moves the ends. Or, if he has been financially successful each year to date, he has had to pay out the following year, with considerable effort, quarterly instalments to Uncle Sam. He knows that a good mechanic, carpenter, shovel runner, or even laborer has no trouble in bringing home as much bacon as he. What is the professional attitude of this man? Should he stick to his career or try a change of work in an attempt to make his income adequate to span those moved ends? Is not an airing of his views with other members of this Society beneficial to him, as well as to those both younger and older?

Then let us consider the next older group, men with, say, ten years of experience, and assume that they have a liking and fitness for their work or they would not have been there for that length of time. They have families to raise and educate, and mortgages to pay off, as a rule, and by that time the only individual of that group who doesn't know where his money goes obviously isn't married. A man who says he is the boss in his own home will lie about other things, too! But this group can at the present time not be considered more stable than the former groups mentioned, as far as their professional status in a water-works vocation is concerned. Salaries paid and duties involved are paramount problems. Just how these problems are resolved in individual cases determines whether or not good professional material is kept, not only on the job, but kept actively interested in what is best for the job. It seems that our Association should, and does, render opportunity for a forum of ideas which is available to anyone in helping him to resolve such problems.

For older groups, if they have worked faithfully eight hours a day and not worried, many have found that they have become bosses and now work sixteen hours a day and have all the worry. They have their problems, too. If they have not been what they consider too successful, they suspect their birthstone was a grindstone, and if they consider themselves successful, many are inclined to develop minds like concrete—all mixed up and permanently set. Or many begin to

wonder if success is not a fraud, because by the time they are in a position to sleep late in the morning, they find they always wake up early, ready to get started. To keep these groups in properly interested frames of mind, for the best interests of the profession, is as much a part of the Association's privilege and duty as for the other groups.

Most of you are sure I have been rambling here, and perhaps I have been, but with a play on words and ideas I want to lay a little groundwork for the message I wish to convey. If you have not seen it from the foregoing conglomeration, I do not blame you, but that message is simply this: Water-works service is a public necessity and carries on twenty-four hours a day, seven days a week. It takes men interested in supplying adequate quantities of good-quality water full time, with a sense of pride in such accomplishment. I think it is incumbent upon this Society to gather into its membership all water-works operators and engineers, with the avowed purpose of association and discussion of our professional and allied problems, in order that the profession's duty to society is not mitigated, that careers are fostered and not just jobs filled, that apathy and carelessness do not replace interest and pride, that construction and operation become matters of skilled production and efficient management and do not slip into "good-enough" building of facilities and mediocre housekeeping, and that all of our members remain alive and definite in their objectives, and that they do not become aimless in purpose and discouraged in heart.

I thank you.

PRESIDENT DUFFY. This concludes the formal program. There will now be dancing in the main ball-room.

[*Adjourned.*]

ANNUAL REPORT OF THE SECRETARY

August 31, 1953

Mr. President and Members of the New England Water Works Association:

The Secretary herewith submits the following report of the changes in the membership during the past fiscal year and the general condition of the Association.

The present membership is 1,071, constituted as follows: 14 Honorary Members, 887 Members, 134 Associate Members and 36 Corporate Members.

MEMBERSHIP

				Total
September 1, 1952—Honorary Members, Total				14
September 1, 1952—Members, Total		864		
Withdrawals:				
Died	16			
Dropped	8			
Resigned	10	34	830	
Elected:				
September 7, 1952	7			
October 24, 1952	4			
November 20, 1952	3			
December 18, 1952	1			
January 22, 1953	3			
February 19, 1953	9			
March 19, 1953	6			
April 16, 1953	9			
May 21, 1953	6			
June 18, 1953	4			
August 14, 1953	4	56		
Reinstated:				
August 14, 1953	1	1	57	887
September 1, 1952—Associates, Total		129		
Withdrawals:				
Resigned	4	4	125	

Elected:				
September 7, 1952	1			
October 24, 1952	1			
February 19, 1953	1			
April 16, 1953	2			
May 21, 1953	2			
June 18, 1953	1			
August 14, 1953	1		9	134
September 1, 1952—Corporates, Total		35		
Withdrawals:				
Resigned	1	1	34	
Elected:				
January 22, 1953	2		2	36
September 1, 1953—Total membership				1,071
September 1, 1952—Total membership				1,042
			Gain of	29

ELECTIONS

Members

September 7, 1952—David C. Buckley, John B. Casazza, Charles H. Darling, William H. Green, Jr., Claude F. Halsey, Peter E. Pallo and Carey A. Walbridge. (7)

October 24, 1952—Charles C. DeFronzo, Virgil W. Langworthy, Edwin A. Schmitt and Edward P. Williams. (4)

November 20, 1952—Gilbert T. Joly, Edward J. McDermott and Ralph E. Preble, Jr. (3)

December 18, 1952—Elmer S. Whiteley. (1)

January 22, 1953—Ronald I. Marshall, Robert L. McGrath and Albert E. Mountain. (3)

February 19, 1953—Ernest R. Coutermarsh, Kenneth P. Currie, Paul J. Higgins, E. Boyd Livesay, Anthony J. Molinaro, Eugene F. Redlon, Samuel L. Satcher, Edgar P. Snow and George H. Wile. (9)

March 19, 1953—Carl A. Arenander, Frederick W. Anthony, John H. Miller, Frank X. Pooley and John W. Whitehead. (6)

April 16, 1953—Mathew M. Braidech, LeRoy J. Evans, John L. Farley, Charles A. Gibbons, Walter E. Gibbs, William T. Ingram, Wilburt H. Locke, Morris A. Nussbaum and Donald A. Robb. (9)

May 21, 1953—Gordon C. Anderson, Francis G. Duclos, Macy F. Joseph, Lawrence B. Maxfield, Benjamin C. Nesin and John M. Reilly. (6)

June 18, 1953—Richard N. Berry, James C. Crenshaw, Thomas K. A. Hendrick and John W. Warren, Jr. (4)

August 14, 1953—Roland S. Burlingame, Edward R. Donahoe, John J. Murphy and Edgar W. Nickerson. (4)
Reinstated: Robert L. Wiley. (1)

Associate Members

September 7, 1952—The Alabama Pipe Company. (1)

October 24, 1952—National Supply Engine Corporation. (1)

February 19, 1953—M. C. Britt Company. (1)

April 16, 1953—Magnamatic Corporation of America and W. B. Parsons Company. (2)

May 21, 1953—John J. Boyle, Contractor, and The Torrington Supply Company, Inc. (2)

June 18, 1953—New England Concrete Pipe Corporation. (1)

August 14, 1953—W. C. Ferguson, Contractor. (1)

Corporate Members

January 22, 1953—Abington Water Works and the Honolulu Board of Water Supply. (2)

WITHDRAWALS

Members

Resigned—Russell H. Babcock, Walter M. Bussolari, Jr., William J. Lumbert, Walter M. Nagle, John L. Osslinski, Philip W. Pease, Fred E. Potter, Peter Pryharski, Daniel M. Ryan and Philip L. White. (10)

Died—Roger W. Armstrong, Rollo K. Blanchard, J. Arthur Carr, Horace H. Chase, Stuart E. Coburn, Walter C. Conroy, Caleb S. Harriman, Scott Keith, Howard M. King, Thomas E. Lally, Harry G. Northrop, Carroll I. Pritham, Eben F. Putnam, Marshall R. Sharpe, John A. Steinberg and Lazarus White. (16)

Dropped—Robert R. Curtis, Miguel T. Escribano, Philip D. Granger, Edward A. Graustein, Douglas Harwood, Dr. Enrique E. Lilue, John P. Miller and Charles K. Moore. (8)

Associate Members

Resigned—Allis-Chalmers Manufacturing Co., Chase Brass & Copper Company, Edward F. Hughes Company and Perkins-Milton Company. (4)

Corporate Members

Resigned—Milford Water Company. (1)

RECEIPTS FOR THE FISCAL YEAR SEPTEMBER 1, 1952, TO SEPTEMBER 1, 1953

Entrance Fees	$ 233.00
Dues of Members of all grades	7,854.00
Dividends	570.00
Advertisements	5,628.50
Subscriptions	670.05
Journals	68.09
Membership Certificates	33.00
Membership Lists	3.75
Total Receipts	$15,060.39

There is due the Association:

Dues	$ 78.00
Advertising	135.50
	$213.50

Respectfully submitted,

(*Signed*) JOSEPH C. KNOX, *Secretary*

ANNUAL REPORT OF THE TREASURER

Boston, September 15, 1953

To William P. Melley, Treasurer,
New England Water Works Association,
Boston, Massachusetts.

We have examined the statement of assets and funds and the statement of cash receipts and disbursements of the general fund of the New England Water Works Association for the year ended August 31, 1953. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

We traced all recorded receipts into the depositary bank, verified the general fund bank account and petty cash fund as at August 31, 1953, and examined properly approved vouchers for all disbursements. We also verified by direct communication the investment funds on deposit in the Milton Co-operative Bank, and on September 10, 1953, we examined the United States Treasury savings bonds and the paid-up coöperative bank shares at the First National Bank of Boston.

In our opinion, the accompanying statement of assets and funds and the note thereon and the related statement of cash receipts and disbursements of the general fund present fairly the financial position of the New England Water Works Association at August 31, 1953, and the recorded cash receipts and disbursements for the year then ended, on a cash basis consistent with that of the preceding year.

(*Signed*) SCOVELL, WELLINGTON & COMPANY

STATEMENT OF ASSETS AND FUNDS (Exhibit A)

As at August 31, 1953

Assets

Securites, invested funds		
U. S. Treasury savings bonds G 2½s, 1954	$10,000.00	
Braintree Co-operative Bank, 10 paid-up shares	2,000.00	
Milton Co-operative Bank, 25 shares series of June, 1940	4,964.50	
Sandwich Co-operative Bank, 10 paid-up shares	2,000.00	
Stoneham Co-operative Bank, 10 paid-up shares	2,000.00	$20,964.50
General fund		
Cash, First National Bank of Boston	$ 3,928.69	
In office	50.00	
	$ 3,978.69	
Furniture and fixtures	1,180.00	5,158.69
		$26,123.19

Funds

Invested funds		$20,964.50
General fund		
Balance, August 31, 1952	$ 6,892.81	
Less Purchase of Milton Co-operative Bank shares	300.00	
	$ 6,592.81	
Excess of disbursements over receipts, Exhibit B	(1,434.12)	
Balance, August 31, 1953		5,158.69
		$26,123.19

Note: The statement above, prepared on a cash basis, includes dues received in advance, $4,968, and employees' withholding tax, $139.12. It does not reflect the following:

Accounts receivable, dues	$ 78.00
Due on account of advertising	135.50
	$ 213.50

No depreciation has been taken on furniture and fixtures.

STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS (Exhibit B)
General Fund

For the Year Ended August 31, 1953

Receipts (exclusive of dues received in advance and employees' withholding tax)			
Initiation fees		$ 233.00	
Dues, 1952-1953 and prior years		2,886.00	
Interest		570.00	
From publication of Journal			
Advertisements	$ 5,628.50		
Subscriptions	670.05		
Sale of Journal	68.09	6,366.64	
Miscellaneous			
Membership certificates	$ 33.00		
Membership lists	3.75	36.75	
Total receipts			$10,092.39
Disbursements			
Publication of Journal			
Printing	$3,782.57		
Plates	196.75		
Reprints	545.45		
Reporting	251.82		
Stationery and postage	85.57		
Editor's salary	750.00		
Steel shelves for journals	136.62		
Sundry	116.89	$5,865.67	
General and administrative			
Certificates of membership	$ 29.86		
Secretary's salary	750.00		
Assistant to secretary—salary	3,120.00		
Treasurer's salary	200.00		
Printing, postage and stationery	93.12		
Office supplies and expense	207.25		
Office rent	1,220.00		
Electricity	85.24		
Telephone and telegraph	287.52		
Auditing	85.00		
Social security taxes	202.48		
Recovering office chairs	165.00		
Sundry	97.11	6,542.58	

Meetings and committees			
Water works school	$ 100.00		
Printing, postage and stationery	1,587.33		
Convention expense	514.76		
Dinners	844.20		
Contribution to June conference	150.00		
Publicity	400.00		
Sundry	349.97	3,946.26	
Interest added to co-operative bank shares		140.00	
Total disbursements			16,494.51
Excess of disbursements over receipts (exclusive of dues received in advance and employees' withholding tax for current year)			($6,402.12)
Dues received in advance		$4,968.00	
Employees' withholding tax			
Receipts for current year	$ 139.12		
Less Payment for prior year	139.12	—	4,968.00
Excess of disbursements over receipts, Exhibit A			($1,434.12)
Balance, general cash, August 31, 1952		$5,712.81	
Less Purchase of Milton Co-operative Bank shares		300.00	5,412.81
Balance, general cash, August 31, 1953			
Represented by			
Cash in First National Bank of Boston		$3,928.69	
Cash in office		50.00	
			$ 3,978.69

ANNUAL REPORT OF THE EDITOR

To the New England Water Works Association:

The Editor submits herewith his report for the year ending August 31, 1953. The financial figures, tabulated in the report, are derived from the report of the Treasurer, which contains a detailed statement of the receipts and disbursements on account of the September and December, 1952, and March and June, 1953, issues of the JOURNAL.

In Table 1 is presented a statement of the material contained in the four issues of the JOURNAL for the past year, while in Table 2 is given a comparison of the JOURNAL for the past year with those for preceding years.

TABLE 1.—STATEMENT OF MATERIAL IN SEPTEMBER AND DECEMBER, 1952, AND MARCH AND JUNE, 1953, ISSUES OF THE JOURNAL OF THE NEW ENGLAND WATER WORKS ASSOCIATION

	Papers	Proceedings*	Total text	Index	Advertisements	Cover and contents	Insert plates	Total pages	Total cuts
Sept., 1952	95	2	97	0	47	4	1	149	9
Dec., 1952	21	85	106	10	45	5	1	167	4
Mar., 1953	73	30	103	0	45	4	1	153	30
June, 1953	72	43	115	0	45	4	2	166	35
Total	261	160	421	10	182	17	5	635	78

*Including standard specifications and recommended practice.

Size. The four issues contained 635 pages, of which 421 were text.

Cost. The gross cost of the JOURNAL was $5,865.67, equivalent to $5.55 per member; the surplus was $500.97, equivalent to $.47 per member.

Reprints. Reprints of papers have been furnished to authors at cost.

TABLE 2.—COMPARISON OF JOURNALS OF THE NEW ENGLAND WATER WORKS ASSOCIATION
Four Issues for Fiscal Year Ending August 31

	1944	1945	1946	1947	1948‡	1949‡‡	1950‡‡‡	1951*	1952**	1953***
Average edition (copies printed)	1,200	1,200	1,200	1,275	1,350	1,325	1,250	1,300	1,390	1,420
Average membership	799	806	820	846	876	905	921	957	1,017	1,057
Circulation at end of year	1,015	1,032	1,042	1,083	1,129	1,164	1,172	1,240	1,283	1,331
Pages of text	442	438	391	428	411	452	440	423	463	421
Pages of text per 1,000 members	553	543	477	516	469	500	477	442	456	398
Total pages, all kinds	621	630	586	632	615	661	666	703	671	635
Total pages per 1,000 members	777	782	715	747	702	731	723	734	660	601
GROSS COST:										
Total	$3,406.48	$3,734.19	$4,053.08	$4,193.60	$4,239.64	$5,016.44	$5,240.51	$6,069.62	$5,423.98	$5,865.67
Per copy	0.71	0.78	0.84	0.82	0.78	0.95	1.05	1.17	0.98	1.03
Per page	5.49	5.83	6.91	6.63	6.90	7.60	7.86	8.64	8.08	9.23
Per member	4.26	4.63	4.94	4.96	4.84	5.55	5.69	6.34	5.34	5.55
Per member per 1,000 pages	6.87	7.35	8.43	7.85	7.87	8.40	8.55	9.02	7.96	8.75
Per member per 1,000 pages of text	9.66	10.57	12.62	11.58	11.78	12.28	12.92	14.99	11.52	13.19
SURPLUS:										
Total	$407.21	$455.57	$162.33	$913.91	$1,990.81	$1,058.96	$1,294.73	$351.34	$1,040.76	$500.97
Per copy	0.08	0.09	0.03	0.18	0.37	0.20	0.26	0.07	0.19	0.09
Per page	0.66	0.72	0.28	1.44	3.32	1.60	1.94	0.50	1.55	0.79
Per member	0.51	0.57	0.20	1.08	2.28	1.17	1.41	0.37	1.02	0.47
Per member per 1,000 pages	0.82	0.90	0.34	1.71	3.71	1.77	2.12	0.53	1.52	0.74
Per member per 1,000 pages of text	0.92	1.29	0.51	2.52	5.55	2.59	3.20	0.88	2.20	1.12

‡Including 54 pages of standard specifications.
‡‡Including 107 pages of standard specifications and recommended practice.
‡‡‡Including 25 pages of standard specifications.
*Including comprehensive index, 1882 to 1950.
**Including 16 pages of standard specifications.
***Including 87 pages of standard specifications and recommended practice.

Circulation. The present circulation of the JOURNAL is:

Members, all grades	1,071
Subscribers	173
Exchanges	23
Advertisers	64
Total	1,331

JOURNALS have been sent to all subscribers and to advertisers.

Respectfully submitted,

(*Signed*) GEORGE C. HOUSER, *Editor*

ANNUAL REPORT OF THE FINANCE COMMITTEE

August 31, 1953

To the Executive Committee of
the New England Water Works Association:

The Finance Committee herewith submits its report on the budget for the year 1952-1953, and its recommended budget for the year 1953-1954.

The Committee has examined the figures obtained from the records of the Association during the past year and has consulted with the Treasurer with reference to probable revenue and disbursements during the coming year.

The following changes have taken place in the membership list:

	Resigned	Died	Dropped	Elected	Gains
Members	10	16	8	57	23
Corporates	1			2	1
Associates	4			9	5
	15	16	8	68	29

The following tabulation is the estimated and actual budget for the past year:

REVENUE FOR 1952-1953

	Budget	Actual
Initiation Fees	$ 200.00	$ 233.00
Dues	7,200.00	7,854.00
Interest and Dividends	500.00	430.00
Journal	6,300.00	6,366.64
Miscellaneous	100.00	36.75
	$14,300.00	$14,920.39

EXPENDITURES FOR 1952-1953

	Budget	Actual
General and Administrative	$ 7,000.00	$ 6,542.58
Journal	6,100.00	5,865.67
Meetings and Committees	2,800.00	2,840.85
Publicity	800.00	400.00
Net expense of luncheons	800.00	705.41
Contingencies	500.00	
	$18,000.00	$16,354.51

Our estimated deficit of $3,700.00 for the past year actually amounted to only $1,434.12. This difference between the estimated and actual deficit was due to the promptness with which the members paid their dues. The actual revenue exceeded our estimated budget by $620.39, due to a substantial increase in the membership.

The disbursements were within the confines of the budget, except for the item covering Meetings and Committees. The expenditures under this item were only slightly over the amount anticipated in the budget.

The Finance Committee again considered the advisability of increasing the Association dues, but after careful review of the Association's finances, it was decided that it would not be advisable, considering the fact that the Association has a substantial balance in the General Fund at the present time.

In setting up the budget for the coming year, the Committee gave considerable thought to the advisability of placing an item in the budget to provide for funds to be used for publicity purposes. We suggest that the Executive Committee give careful consideration to the advisability of continuing this work. In the event that the Executive Committee desires that funds be made available for publicity, we feel that we have provided sufficient funds for this purpose under Contingencies.

The Finance Committee has again set up a deficit budget for the coming year. In all probability, if our membership continues to increase, our deficit will be much less than anticipated.

BUDGET FOR 1953-1954 — REVENUE

Initiation Fees	$ 200.00
Dues	7,600.00
Interest and Dividends	350.00
Journal	6,300.00
Miscellaneous	50.00
	$14,500.00

BUDGET FOR 1953-1954 — DISBURSEMENTS

General and Administrative	$ 7,000.00
Journal	6,000.00
Meetings and Committees	3,000.00
Net expense for luncheons	800.00
Contingencies	800.00
	$17,600.00

We refer you to the Treasurer's report for further financial details and to the Secretary's report for changes in the membership listing.

Respectfully submitted,

(*Signed*) HAROLD J. TOOLE, *Chairman*
THOMAS S. LAWRENCE
GEORGE N. WATSON

REPORT OF MEMBERSHIP COMMITTEE

September 25, 1953

To the New England Water Works Association:

Fifty-seven (57) active members, nine (9) associate members, and two (2) corporate members have joined the association this past year.

This makes a total membership of 1,071 members as of September 25, 1953, with eight (8) applications pending.

Respectfully submitted,

JOHN J. BAFFA
LENDON F. DUTTON
JOSEPH E. MOORE
HOWARD H. POTTER
JAMES A. SWEENEY
JAMES V. TURNER
(*Signed*) GEORGE W. COFFIN, *Chairman*

ANNUAL REPORT OF THE LIBRARY COMMITTEE

September 23, 1953

To the New England Water Works Association:

The Library Committee wishes to call your attention to the gift of bound volumes of our Association JOURNALS for the years 1900 to 1916 by the wife of the late George A. Taber. These, with other recent gifts, provide duplicate bound volumes of our JOURNALS from 1900 to 1928. These duplicates permit greater use of the library, since they can be loaned. The original set has to be used in the library. We hope that friends, having bound volumes not now in use, will supplement our duplicate set, so that we may have a complete set for loaning.

The Committee would like to remind the members that bound volumes of the following publications are available for their use:

JOURNAL of New England Water Works Association, 1882 to date

Journal of American Water Works Association, 1920 to date

Journal or Transactions of British Institution of Water Works Engineers, 1901 to date.

In addition, current numbers of many water-works and other engineering publications are available. The book section contains reference books and books of historical significance.

The library books have not been evaluated in the last few years. The Committee recommends that the library books be reviewed, and culled or supplemented during the coming year, as required to serve best the needs of our Association.

(*Signed*) ARIEL A. THOMAS, *Chairman*
EDWIN B. COBB

REPORT OF COMMITTEE ON TECHNICAL PROGRAM

July 29, 1953

To the New England Water Works Association:

The report of the Technical Program Committee is herewith presented.

Technical programs were arranged for the five Boston meetings, the June Outing and the Annual Convention. The March meeting was held at the Hotel Continental, Cambridge, Mass., and included an inspection of the new facilities of the Cambridge Water Department.

Mr. Sherman Rogers and Mr. Kenneth Knowlton arranged interesting programs for the Superintendents' and Chemists' Meetings.

The Chairman expresses his appreciation to the members of the Technical Program Committee, the Officers of the Association, and the Secretary's office for their coöperation during the year 1952-53.

(*Signed*) F. E. SMITH, *Chairman*

REPORT OF COMMITTEE ON COMMITTEES

1952 - 1953

To the New England Water Works Association:

The Committee on Committees, composed of members of the Executive Committee, is increasingly aware of the necessity of the proper functioning of the various technical committees and wishes to thank all members who have served on any of these committees. They are also cognizant of the time and effort expended to prepare and submit reports annually, and of the great value to the membership in having these reports available. It has been very interesting to note the numerous requests received from people outside of the Association for these reports.

The duties of the Committee on Committees are to review the progress of the committees and to make recommendations for the continuance of active committees and the discharge of those whose duties have been fulfilled, and to propose the establishment of new committees.

Committees to Be Continued

**N.E.W.W.A. 8. Committee on Legislation

** 9. Committee on Reciprocal Relations with the Institution of Water Engineers (England)

**11. Committee on Survey of Ground Water Supplies in New England

**12. Committee on Rainfall and Yield of Drainage Areas

**16. Committee on Coëfficients for Friction in Pipe Lines

19. Committee on Water Quality and Treatment

20. Committee to Report on Developments in Our Knowledge of Corrosion and Its Mitigations

**21. Committee on Specifications for Cast-Iron Pipe and Fittings (Sec. Comm. A.S.A.)

**Expects to submit progress report at 1953 Annual Convention.

**22. Committee on Reinforced-Concrete Pressure Pipe (Joint A.W.W.A.)
23. Committee on Code for Pressure Piping (Joint A.S.M.E.)
**24. Committee on Laying Cast-Iron Pipe (Joint A.W.W.A.)
**25. Committee on Specifications for Steel Pipe (Joint A.W.W.A.)
**26. Committee on Standardization of Pipe Flanges and Fittings (Sec. Comm. A.S.A.)
28. Committee on Steel Standpipes and Elevated Tanks (Joint A.W.W.A.)
31. Committee on Hydrant Specifications (Joint A.W.W.A.)
32. Committee on Gate Valves (Joint A.W.W.A.)
37. Committee on Federal Activities (Joint A.W.W.A.)
**38. Committee on Fluid Permeability (Sec. Comm. A.S.A.)
39. Committee on Deep-Well Vertical Pumps (Sec. Comm. A.S.A.)
**40. Committee on Water-Rate Schedules (Joint A.W.W.A.)
41. Committee on Interstate Aid in Civil Defense
**42. Committee on Conservation, Development and Utilization of Water Resources
**44. Committee on Publicity

Committee to Be Discharged

*N.E.W.W.A. 43. Committee on Cost Data for Water Mains and Services

Establishment of New Committees

During the year one new committee was established —

N.E.W.W.A. 45. Committee on Recreational Uses of Public Water Supplies

In addition to technical committees, Association representatives were appointed as follows:

**Expects to submit progress report at 1953 Annual Convention.
*Expects to submit final report at 1953 Annual Convention.

Research Council on the Causes and Methods of Prevention of Internal Corrosion of Water Pipes. Thomas R. Camp, Representative.

Task Group, Water Facilities Security Program—Public Health Service. Clarence I. Sterling, Jr., Representative.

Conclusions and Recommendations

The Committee on Committees recommends that the committees listed be continued, and that a committee be established to study the suitability of plastic pipes and plastic linings for water-supply uses.

The Committee on Committees will be very pleased to receive any suggestions for the establishment of new committees which may result in the furtherance of the water-works profession.

Respectfully submitted,

COMMITTEE ON COMMITTEES

ANNUAL REPORT OF THE COMMITTEE ON LEGISLATION

September 28, 1953

To the New England Water Works Association:

Your Legislative Committee submits herewith its report on activities in the legislatures of the New England states during the year 1953.

All six states held sessions and a section of this report will be devoted to each.

In Connecticut there were 65 bills introduced at the session which, in one way or another, related to some phase of water-supply activities. The more important of these bills were as follows:

(1) *Fluoridation.*

Five bills involved fluoridation. Two would have permitted fluoridation by regulations of the State Department of Health and would have permitted the cost of fluoridation to be included in the rate base.

Another would have made fluoridation of public water supplies unlawful and subject to a $5,000 fine, or imprisonment of not more than five years, or both.

The theory of the fourth bill was that the public should not be subjected to fluoridation without freedom of choice, as long as there remains any element of danger in its use.

The final bill would have permitted the sale of bottled fluoridated water, meeting the requirements of the State Department of Health. The purpose of the bill was stated to be in order that there may be freedom of choice and to prevent unnecessary expenditure of taxpayers' money, since only 10% of all water supply is used for drinking and cooking.

None of the fluoridation bills were enacted into law.

(2) *Reimbursement to Utilities of Expense Incurred in Connection with State Highway Construction.*

Bills were introduced which would have obligated the State Highway Department to reimburse private and public water utilities for the expense incurred in relocating their structures, due to all state highway construction.

The bill finally passed by the legislature was extended to cover all utilities, but was restricted to partial reimbursement for work done in connection with throughways only.

(3) *A Bill Assessing Certain Expenses of the Public Utilities Commission against Public Service Companies.*

This bill, which was approved, apportions 45% of expenses of the Public Utilities Commission, but not in excess of $250,000, among the public service companies of the State, including private but not municipal water companies whose gross annual earnings exceed $3,000. The assessment of each company is in proportion to that company's gross earnings to the gross earnings of all companies in the State. For 1953 the amount to be paid by each company is about 1/8th of 1% of its gross earnings.

The 1953 Maine Legislature enacted several measures having a bearing on water-supply operations.

Chapter 324, relating to fluoride in public water supplies, is an amendment of Sec. 122B of Chapter 131 of the Public Laws of 1951 – plus an additional section reading as follows:

"Sec. 122-C. Fluoride in public waters; authorization. No such public utility or agency shall add any fluoride to any such water supply without first having been authorized to do so by the municipality or municipalities served by it. In the case of a city, such authorization shall be by a majority vote of the legal voters voting at a regular or special city election. In the case of a town or plantation, such authorization shall be by a majority vote of the inhabitants present at an annual town or plantation meeting. In the case of a public utility or agency serving more than one municipality, such authorization shall be by a majority vote of the voters voting at such city election and a majority vote of the inhabitants present at an annual town or plantation meeting of each town or plantation served by such public utility or agency; provided, however, that authorization by municipalities representing 80% of the customers served by such public utility or agency shall be sufficient. The public utilities commission, upon application, shall determine and allocate the cost of such fluoridation among the customers of such public utility or agency and shall from time to time review such determination and allocation as required."

Another enactment on the subject of fluoridation is Chapter 361 which amends prior legislation and designates Fluoride Poisoning as an occupational disease.

Chapter 377—An Act Relating to Facilities Furnished by Public Utilities,

(1) Amends sections 16 of Chapter 40 of the revised statutes;
(2) Repeals and replaces section 17;
(3) Adds section 67-A.

The amendment of section 16 pertains to the establishing and maintenance of reasonable and just charges; re-enacted section 17 relates to valuation of property made for fixing rates, and section 67-A provides for additional court review in the event an issue develops on the subject of rates, tolls or charges fixed by any public utility.

Chapter 331, as enacted, is an amendment of Chapter 72 of the revised statutes, providing for the classification of certain surface waters throughout the state of Maine.

Chapter 403 amends existing law relating to the Water Improvement Commission and establishes four standards of classification for the surface waters of the state and its tidal flats.

Chapter 421 adds 10 new sections to Chapter 80 of the revised statutes, which authorizes towns to issue Revenue Bonds for Public Improvement, both establishing and defining procedures relating to their issuance and sale, as well as determining the use to which the funds realized are to be devoted.

Many bills having a bearing on water-supply activities were presented to the recent session of the Massachusetts Legislature for consideration, resulting in passage of the following Acts and Resolves worthy of mention in this report:

Chapter 45—A Resolve providing for an investigation and study by a special commission relative to contracts for public building projects.

Annually, over a period of several years, numerous bills on this subject have been filed by interested parties, notably the Associated General Contractors, Associated Independent Subcontractors and the Building & Construction Trade Council. Hearings have been productive of long and heated debate, with the Legislature each year in the past either rejecting, giving leave to withdraw, or referring to the next annual session all proposed legislation. The special commission, created under the provisions of Chapter 45, is directed to file a report not later than the first Wednesday of December in the current year and presumably will make recommendations for the formulation of sound legislation on this subject.

Chapter 58—A Resolve providing for an investigation and study by a special commission relative to the fluoridation of public water supplies, was developed as House Bill 2603, subsequent to hearings on House Bill 1167. The latter bill, if enacted, would have prohibited

the fluoridation of public water supplies. It might be pointed out that, as of the date of this report, a number of cities and towns in the state have delayed local action as to the adoption of fluoridation of their water supplies, pending the filing of the commission report with the general court no later than the first Wednesday in December of the current year.

Chapter 83—A Resolve Providing for an Investigation and Study by the Department of Public Works Relative to Certain Ponds and Lakes, reads as follows:

> "The department of public works is hereby authorized to make an investigation and study of the advisability of changing the definition of a great pond and relative to establishing rights of way for public access to certain great ponds. Said department shall report to the general court the results of its investigation and study, together with drafts of legislation necessary to carry its recommendations, if any, into effect, by filing the same with the clerk of the house of representatives on or before the first Wednesday of December in the current year."

As interesting examples of legislation reflecting the currently developing trend toward the restriction of water-main extensions by cities and towns of the state, your committee points out Chapters 324 and 657, enactments pertaining to the towns of Lee and Cohasset, respectively. Section 10, as amended under Chapter 324 reads,

> "If, for any reason, the board of water commissioners should refuse to extend water mains or pipes into sections of the town not previously supplied with water from the town water works, a two-thirds vote by ballot of an annual town meeting shall be necessary to annul such refusal".

Chapter 657, entitled "An Act Authorizing the Town of Cohasset to Install Water Lines and to Supply Water to Certain Inhabitants of Said Town, and to Provide for the Apportionment of the Cost Thereof", provides for equitable assessments, as determined by the water commissioners in conformance with the provisions of this chapter, to defray the cost of water-main extensions and make the property thus assessed subject to the provisions of the lien law.

As further evidence of the current situation as to policy regarding the adoption of fluoridation, we mention Chapter 375—An Act to ascertain the will of the voters of the city of Northampton with reference to the question of fluorinating the public domestic water supply.

This legislation provides that the question, "Shall the public domestic water supply in this city be fluorinated?", be placed this year on the official ballot for the biennial city election. It further provides that a majority vote, either affirmative or negative, shall decide the issue.

Chapter 540 authorizes the city of Taunton to borrow money for a period of five years from date of Act, to defray the cost of specific expansion and development of its water-supply facilities, in the aggregate not to exceed a cost $1.7 million (other than expenses of maintenance and operation), to improve the adequacy and reliability of water service for fire protection and for domestic business and industrial use throughout the city. The Act further authorizes the issuance of bonds or notes, repayable in not over thirty years from date of issuance. Indebtedness incurred under this Act shall be within the limits of the amount prescribed by the last paragraph of section 8 of Chapter 44 of the General Laws and, except as otherwise provided herein, shall be subject to the provisions of said chapter.

Chapter 618 is entitled "An Act to Provide for Increasing the Rate per Million Gallons to Be Charged Cities and Towns Which Are Members of the Metropolitan Water District."

Prior to 1946, the cost of furnishing water by the district to the member cities and towns was apportioned 1/3 on the basis of valuations and 2/3 on the basis of consumption. Chapter 587 of the Acts of 1945 established a rate of $40 per million gallons, with a view to bringing additional cities and towns into the district with the approaching completion of construction of the district's expanded supply facilities. It was evident, within a short time, that the $40 rate would not suffice to defray the District's expenses and pay off the bonded indebtedness. Consequently proposed legislation was introduced annually for a period of three years, commencing in 1950, seeking authorization of an increase. The General Court took no action on the matter during this time. House Bill 96, seeking establishment of a rate of $80 per million gallons, was filed for consideration at the recent session and a concerted co-operative effort was undertaken by the interested parties to ensure the formulation and passage of sound legislation. Chapter 618 establishes a rate of $80 per million gallons and provides that the Commission shall submit stipulated information to the member cities and towns, to keep the latter supplied with a well-rounded picture of the district's operations and plans.

Many measures of local significance were introduced at this session and passed into law.

House 1701—An Act to Authorize the Levy of Special Assessments to Meet the Cost of Laying Water Pipes in Public Ways (permissive legislation), was filed again this year for the third time, but after favorable action by the House failed of passage in the Senate.

In New Hampshire, of the nine bills introduced in the 1953 session having some connection with water-works operations in the state, four were passed into law.

Chapter 52 requires all public utilities which find it necessary or desirable to install pipe lines over, under or across any of the public waters of the state (10 acres or more) to apply to the Public Utilities Commission for a license to do so. However, this legislation is not aimed at public water supplies and it is doubted that application is necessary for any of the normal water-works operations.

Chapter 35 relates to the taxation of property held by a town or district in another town or district for water-supply or flood-control purposes. Heretofore water departments owning land in an adjacent town paid annually, in lieu of taxes, an amount equal to that which such place received for taxes upon the average of the assessed value of such land without buildings or other structures, for the three years last preceding legal process to acquire the same. Under this law the State Tax Commission shall have authority to assess the value held in another town, so that such payment will approximate its proportion of the public charge in each year. Further, the Commission will examine, and raise or lower as may be necessary, the amount paid by the town or district holding the land at least once in every three years. During passage the bill was amended, so as to permit the municipality owning land an appeal from the Tax Commission's assessment.

Chapter 258 is an Act designed to revise Chapter 72, which is the municipal bond statute. The original draft of this measure had a number of features which might be objectionable to water-works departments. However, a new draft was submitted and the bill, as passed in amended form, causes very little change so far as financial operations of a water department are concerned.

Chapter 322 permits the Exeter Water Works to supply a portion of the town of Stratham with water without supervision of the Public Utilities Commission, except as stated in the Act.

The Rhode Island General Assembly held a session in 1953, but no important legislation regarding water-works activities was enacted, according to our committee member from that state.

During the 1953 session of the Vermont Legislature, the following measure pertinent to water systems was passed into law:

Act 36—"An Act to Amend Subdivision III of Section 9360 of Vermont Statute 47, Relating to Jurisdiction of Certain Public Utilities, and to Amend Section 9370 of Vermont Statute 47, Relating to Water Rates.

"Section 1. Subdivision III of section 9360 of the Vermont Statutes, Revision of 1947, is hereby amended to read as follows:

"III. A company other than a municipality engaged in the collection, sale and distribution of water for domestic, industrial, business or fire protection purposes.

"Section 2. Section 9370 of the Vermont Statutes, Revision of 1947, is hereby amended to read as follows:

"9370. Water rates, arrears. A municipal corporation or public service company furnishing water for domestic, business or industrial uses may assess and charge the rate for the service against the owner of real estate where such service is rendered. If such charges are in arrears, such corporation or company, on reasonable notice to such owner, may discontinue its service and shall not be compelled to again furnish the same until such arrears are fully paid by the owner."

Prior to these amendments there was no supervision, by the Vermont Public Service Commission, over "industrial and business" uses of water. The 1947 Statute applied only to "domestic and fire protection" uses of water. Section 9370, prior to amendment, applied only to "domestic" users of water. It was not legally possible, prior to March, 1953, to assess water charges, for business or industrial use, against the owner of the property.

Now it appears that all legal water bills in arrears can be collected from the property owners in Vermont.

Respectfully submitted,

(*Signed*) MARK F. CROKER, *Chairman*
WARREN A. GENTNER
WILLIAM A. HEALY
PHILIP J. HOLTON, JR.
PETER C. KARALEKAS
EDWIN T. MCDOWELL
EDWARD L. TRACY

REPORT OF THE COMMITTEE ON RECIPROCAL RELATIONS WITH THE INSTITUTION OF WATER ENGINEERS (ENGLAND)

September 28, 1953

To the New England Water Works Association:

The Committee on Reciprocal Relations with the Institution of Water Engineers of Great Britain presents herewith its report for the past year:

The outstanding event of the year as related to your Committee's activities was the attendance at last year's convention of Mr. Henry F. Cronin, Chief Engineer of the London Metropolitan Water Board, past-president and honorary member of the Institution of Water Engineers, and currently president of the Institution of Civil Engineers. Mr. Cronin, who was accompanied by Mrs. Cronin, was presented with Honorary Membership in this Association. The paper he presented to the Association is to be published in the JOURNAL. Mr. Cronin's visit further strengthened the ties between our two associations.

The chairman of your Committee has tentative plans to attend the Summer Meeting of the Institution to be held in Plymouth, England, in May, 1954.

Respectfully submitted,

(*Signed*) E. SHERMAN CHASE, *Chairman*
LELAND G. CARLTON
PERCY A. SHAW

PROGRESS REPORT OF COMMITTEE ON WATER-RATE SCHEDULES

The report of the American Water Works Association Committee, headed by Mr. Louis Ayres, is introduced by the following paragraphs:

"The subject of water rates has been involved in controversy for several decades; and it is not possible to resolve this controversy by any simple set of rules. Not only are divergent views involved, but differences in local conditions, laws, public or private ownership, commission or local control and other matters must be considered. As many of these controversial issues have already been reviewed by the committee in recent Journals (1), only those aspects having a bearing on committee recommendations are included in the text of this report.

"In view of the circumstances the committee presents a report which aims to outline the basic elements involved in water rates and suggests *alternate* rules of procedure for formulating rates so as to admit of choice between basic alternatives and thus permit the exercise of judgment and preference to meet local conditions and requirements."

The report is divided into four sections as follows:

SECTION I

The amount of Revenue to be raised
Methods discussed

SECTION II

Classification of Costs:
The demand theory of Rates and the functional classification of costs with an illustrative application

SECTION III

Allocation of expenses as between water users and taxpayers; charges to fire protection, sprinkling load, air conditioning

SECTION IV

Rate Schedules for normal users: "Aims to present *Definite Rules* for the formulation of rates which will distribute normal expense among *all* customers, as nearly as may be, in proportion to the cost of supplying the commodity"
Methods for developing rate schedules are developed on basis of demand, and on function or customer basis.

Your Committee has done very little of the work of formulating this report. After attending a few of the early meetings of the Committee, your Chairman is greatly impressed by the way in which such extremely divergent views have been either reconciled or arranged as alternate methods of procedure.

Your Committee feels that Mr. Ayres and his American Water Works Association Committee are to be congratulated in formulating a report which so well and completely sets forth the general principles necessary for a sound rate schedule, and at the same time suggests alternate rules for meeting divergence of opinions and local conditions.

The report emphasizes the futility of attempting to develop a general rate-schedule formula, applicable to all water-supply systems; with this your Committee agrees.

It is difficult to change the form of existing rate schedules and the proportion of charges to classes of consumers; working with the principles discussed in the Ayres report it is probable that gradually rate schedules will more nearly conform to the standards set up in that report.

After the acceptance of this report by the American Water Works Association, it is probable that your subcommittee will submit it to the New England Water Works Association as a helpful guide in the establishment of water rates.

Respectfully submitted,

WARREN A. GENTNER
EDWIN T. MCDOWELL
(*Signed*) PERCY A. SHAW, *Chairman*

REPORT OF THE COMMITTEE ON SURVEY OF GROUND WATER SUPPLIES IN NEW ENGLAND

YIELD OF GRAVEL-PACKED WELLS

September, 1953

To the New England Water Works Association:

After considerable discussion this Committee voted to investigate the yield of gravel-packed wells which have been in service for a number of years. Assertions had been made that many gravel-packed and gravel-walled wells had been decreasing in yield and the water from them developing undesirable chemical characteristics through usage. The Committee felt that these assertions were not founded on fact and that it would be desirable to make a survey of gravel-packed and gravel-walled wells, to determine whether or not their yield had decreased through usage and whether there was evidence of adverse change in the quality of the water from them.

A questionnaire was prepared and sent from the office of the state sanitary engineer in each New England state to the water-works agencies having gravel-packed or gravel-walled wells. This questionnaire attempted to cover such items as the year of installation of the well, the apparent tributary watershed and area of water-bearing material, the method of construction—whether it was the conventional caisson or the hydraulic method of construction—the type and size of well screen, the size, depth and diameter of gravel placement, the yield at the time of installation and thereafter, reconditioning, if any, with the use of acid, dry ice, Calgon, explosives, etc., and the success of such reconditioning.

It was recognized by the Committee that much of this information would not be available to the water-works superintendent, but it was felt that such information as was available would be valuable in determining whether the above-mentioned assertions were based on fact. A tabulation appended to this report shows the summary of this questionnaire. There are, of course, other gravel-packed wells not included in this summary, but the necessary information on them was not available.

Judging from the results, it appears to the Committee that the gravel-packed or gravel-walled well is a suitable well to be developed for public water-supply purposes. In certain instances these wells can be developed to yield as much as 1,500 gal per minute, depending upon the water-bearing strata. Such a high yield, however, is unusual and no attempt should be made to develop a well to yield more than 1 mgd, unless a careful engineering study establishes the safety of doing so. Complete data on soil porosity and extent of the water-bearing strata should be obtained.

The Committee is of the opinion that there is no reason to believe that gravel-packed wells are any more likely to decrease in yield with continuous usage than any other type of well or that the quality of water from such wells is likely to develop adverse characteristics. While it is true that there have been certain failures of gravel-packed wells, it can also be pointed out that there have been failures in other types of wells and in other sources of supply. The Committee feels that the installation of gravel-packed wells and gravel-walled wells should be under the direction of an engineer skilled in water-supply matters. The size, depth and capacity of the well should be determined only after careful engineering study. In this connection reference may be made to the report of this Committee, which was published in the JOURNAL of the New England Water Works Association in December, 1952.

Respectfully submitted,

JOHN A. BELLIZIA
M. L. BRASHEARS, JR.
HOWARD H. POTTER
WALTER J. SHEA
HENRY N. HALBERG
FRANCIS J. LARIVIERE
LESLIE K. SHERMAN
EDWARD L. TRACY
(*Signed*) RALPH M. SOULE, *Chairman*

SUMMARY OF INFORMATION ON GRAVEL-PACKED WELLS (Number of Wells)

	Age of well					Failures	Adverse changes in quality	Reduction in yield	Reconditioning	Success of reconditioning
	Over 20 yr.	15-20 yr.	10-15 yr.	5-10 yr.	Less than 5 yr.					
Connecticut	3	3	4	7	5	1[1]			1[4]	Good
Maine		1	3	3	1			1	1[5]	Poor
Massachusetts	2	13	13	14	21	2[2]	2[3]	6	6[6]	5 Good 1 Poor
New Hampshire		3	1	3	9				2[7]	Good
Rhode Island			2	3						
Vermont		3	4	5	10				1	Good

[1]Installed in 1937.
[2]One installed in 1939; one installed in 1949.
[3]Increase in iron content.
[4]Installed in 1932.
[5]Installed in 1937.
[6]Installed in 1931, 1937, 1946, 1950 (1950—growth of *Crenothrix*).
[7]Installed in 1934, 1938.

PROGRESS REPORT OF THE COMMITTEE ON RAINFALL AND YIELD OF DRAINAGE AREAS

September, 1953

To the New England Water Works Association:

Station and Drainage Basin records of the "Rainfall in New England" were last published in the Journals of the New England Water Works Association in three parts as follows:

Part I—Rainfall in Massachusetts, Vol. 56, No. 4.

Part II—Rainfall in Maine, New Hampshire and Vermont, Vol. 57, No. 1.

Part III—Rainfall in Rhode Island, Connecticut and Eastern New York, Vol. 57, No. 3.

The above papers presented precipitation data through the calendar year 1941. Precipitation data for the period January, 1942, through December, 1950, are now being prepared for the printer. The manuscript for "Rainfall in Massachusetts" is about 90% complete and it is expected that it will be ready in time for publication in an early number of the JOURNAL.

Precipitation data for Rhode Island have been assembled, and the compilation of reports from the remaining New England States, together with the preparation of the manuscripts, will be pursued in the Division of Sanitary Engineering and should be available for printing in 1954.

For the Committee,

(*Signed*) FRANCIS H. KINGSBURY, *Chairman*

REPORT OF COMMITTEE ON SPECIFICATIONS FOR CAST-IRON PIPE AND FITTINGS

August 31, 1953

To the New England Water Works Association:

Committee A-21 of the American Standards Association, on which the undersigned are your representatives, has continued during the year its efforts to conclude its work on specifications relating to cast-iron pipe and fittings.

This objective has been substantially accomplished in respect to the matters which had been before this committee, but it has recently been suggested that the committee should undertake to deal with specifications for the cement lining of pipes of large diameter.

Whether the committee will do this has not yet been fully decided. Until this decision is made, your representation on the committee should be continued.

Yours respectfully,

(*Signed*) RICHARD HAZEN
ARTHUR L. SHAW

REPORT OF THE COMMITTEE ON REINFORCED-CONCRETE PRESSURE PIPE

September 28, 1953

To the New England Water Works Association:

Your committee members have coöperated with the members of the Water Works Practice Committee E 7 B of the American Water Works Association, and Standard Specifications for Reinforced Concrete Water Pipe—Steel Cylinder Type—Not Prestressed and for Reinforced Concrete Water Pipe—Steel Cylinder Type—Prestressed have been developed and approved as standard by the Board of Direction on June 13, 1952.

Consideration is now being given to the development of tentative specifications for reinforced-concrete pipe without a steel cylinder for both the prestressed and non-prestressed type.

Due to a successful change in manufacturing procedure by some manufacturers, it has been found under certain conditions advantageous to encase the steel cylinder within concrete, to form the core, and wind the wire around the concrete exterior of the core, rather than forming the core by placing a concrete lining within the cylinder and winding the wire around the cylinder, as specified. This Committee is therefore considering an addendum of the specifications for the Reinforced Concrete Water Pipe—Steel Cylinder Type—Prestressed, which will permit prestressing of the core with the concrete exterior to the steel cylinder, as well as when on the interior of such cylinder.

(*Signed*) STANLEY M. DORE, *Chairman*
GEORGE W. COFFIN
HERMAN G. DRESSER

PROGRESS REPORT OF COMMITTEE ON LAYING CAST-IRON WATER MAINS

To the Members of New England Water Works Association:

Your Committee on Laying Cast-Iron Water Mains has continued to coöperate with the corresponding committees of the AWWA in the development of specifications and procedures for the installation of cast-iron water mains and for disinfecting mains.

It was reported at the 1952 annual meeting that the specification for the installation of water mains was being revised. These specifications are still in the hands of the AWWA committee, which is working on proposed revisions dealing with several matters. Your committee feels that it should make no recommendation relative to specifications for the installation of mains until the revisions have been completed.

A procedure for disinfecting water mains was originally published in the February, 1949, issue of the *Journal* of the AWWA. Since then the document has been completely revised. The revision was approved by the AWWA Board of Directors on March 6, 1953, and published in the AWWA *Journal* of August, 1953, under the title, "A Tentative Procedure for Disinfecting Water Mains," and designation "AWWA C601-53T." The same issue of the *Journal* also includes a paper, "Revised Main Disinfection Procedure," by Marshall P. Crabill, Chairman of the committee which developed the revision. His paper is, in effect, an introduction to the "Procedure." Your committee recommends that the Executive Committee approve this document and publish it as tentative for the information of members prior to future action by our Association. It is further recommended that Mr. Crabill's paper also be published.

Respectfully submitted,

(*Signed*) W. S. MARINER, *Chairman*
GEORGE W. COFFIN

REPORT OF THE COMMITTEE ON SPECIFICATIONS FOR STEEL PIPE

September 29, 1953

To the New England Water Works Association:

This Committee acts jointly with Committee E7A of the A.W.W.A. on specifications for steel water pipe. During the past year Committee E7A has prepared a second draft of tentative Standard Specifications for Cement Mortar Lining Steel Water Pipe Lines in place, sizes 16-in. and over. The second draft included a number of suggestions which were made by members of the Committee during the year. This draft was the subject of further discussion at the regular meeting of Committee E7A held in Grand Rapids on May 12.

No communication has been received regarding the action taken by Committee E7A at the meeting in Grand Rapids on May 12.

Respectfully submitted,

(*Signed*) THOMAS R. CAMP, *Chairman*
CHESTER J. GINDER

REPORT OF COMMITTEE ON STANDARDIZATION OF PIPE FLANGES AND FITTINGS

August 31, 1953

To the New England Water Works Association:

The undersigned representatives of N.E.W.W.A. on Committee B-16 of the American Standards Association on Standardization of Pipe Flanges and Fittings have kept in touch with the proceedings of this committee during the past year.

This work of the committee has related to the review and revision or reaffirmation of miscellaneous existing specifications; and to consideration of proposed standards for solder-joint fittings and fittings for flared copper tubes.

While these matters are of general interest to water works men, it appears unnecessary to call any details to your attention at this time. It would be advantageous to continue representation on the committee, so that you may be informed of any particulars which may be vital to our industry.

Respectfully,

(*Signed*) RICHARD HAZEN
ARTHUR L. SHAW

REPORT OF COMMITTEE ON FLUID PERMEABILITY

September 28, 1953

To the New England Water Works Association:

Discussions of tentative proposals for definite definitions of the terms fluid permeation, permeability, piezometric pressure, permeance and transmittance have been in progress and copies of such discussions have been circulated amongst committee members for comment. Because of the wide field covered by the membership of the committee, it is proving difficult for the committee to agree on the appropriate definitions to apply, as various branches of engineering service will use them, and there are conflicts and possible confusion in the proposed standard definitions with the present usage of terms existing in these branches.

A subcommittee of eight members of Committee Z 59, charged with the responsibility of drafting preliminary standards on fluid permeation for subsequent consideration and vote of the committee as a whole, was appointed by the Chairman on March 9, 1953, in accordance with a ballot questionnaire of December 23, 1952, in which 22 of 30 voted in favor of such action.

(*Signed*) STANLEY M. DORE
NEWWA Representative
ASA Section Committee
on Fluid Permeation Z 59

REPORT OF COMMITTEE ON CONSERVATION, DEVELOPMENT AND UTILIZATION OF WATER RESOURCES

September 28, 1953

To the New England Water Works Association:

In August, 1951, the Committee on Conservation, Development and Utilization of Water Resources was appointed by the Executive Committee to follow developments in Federal water-resources legislation, in order that the Association might take appropriate action.

The appointment of this Committee was prompted by the controversial recommendations in the report of the President's Water Resources Policy Commission, released in 1950, and also by a questionnaire from the National Water Conservation Conference in May, 1951, soliciting the attitude of the Association in regard to the recommendations. The National Water Conservation Conference consists of water interests from the States, coöperating to promote local and state participation in plans for water-resources development and to preserve the integrity of State water laws, looking toward the development of a sound national land and water policy.

At the Annual Convention of the Association in 1951, upon recommendation of this Committee, a resolution, setting forth the views of the Association in regard to a national water policy and directing the Executive Committee to take action on behalf of the Association consistent therewith, was unanimously adopted.

This Committee at the Annual Convention in 1952 reported that legislation, proposed by the President's Water Resources Policy Commission, had been submitted to President Truman, who considered it too controversial and directed the Bureau of the Budget to study the matter and to prepare legislation for his consideration. It was also reported that the proposed legislation of the President's Water Resources Policy Commission had been released and was, as anticipated, in variance with the ideas of the Association and the Engineers' Joint Council. This Committee further reported that the Bureau of the Budget legislation had been submitted to President Truman, but not made public.

No action was ever taken by President Truman on the Bureau of the Budget legislation and it was transmitted for consideration by President Eisenhower, when the new administration assumed office. This legislation has never been publicly released. The Eisenhower administration is vitally interested in the matter of a national water-resources policy, as advocated in the Republican platform of 1952, but to date has not taken any positive action. From information available, various organizations representing the so-called liberal element, which advocates Federal control of water resources, are active in an attempt to impress the new administration with their philosophies.

In February, 1953, the Land and Water Resources Policy Committee of the National Water Conservation Conference presented to the Conference a report, setting forth the objectives of a national land and water resource development policy. The report was unanimously accepted and copies were widely distributed, with a request for the submission of comments prior to June, 1953. That Committee proposes to meet in October to draft legislation which will receive similar distribution for comments. Presentation of the legislation to Congress is anticipated in January, 1954. In this connection, the Executive Committee, at its meeting in May, 1953, voted that the Association be recorded as supporting the efforts of the National Water Conservation Conference in the formulation of legislation for a national water policy. News releases of this action were distributed through the Associated Press.

In view of the interest in this matter and probable Congressional action affecting the Association and its members, this Committee, in accordance with the directive of the Association, will continue its policy of advising the Executive Committee of any developments and recommending any action deemed necessary or desirable.

Respectfully submitted,

(*Signed*) THOMAS R CAMP, *Chairman*
JOSEPH C. KNOX
BYRON O. MCCOY

REPORT OF COMMITTEE ON COST DATA FOR WATER MAINS AND SERVICES

To the Members of the New England Water Works Association:

Last year, as the result of a Superintendents' Round Table discussion on this subject, at which great interest was shown and a lively discussion ensued, the Directors appointed a committee to study the matter further. The only way to get reliable data was to send out questionnaires to all operators who were members of the Association. From 225 mailed 155 replies were received, or a 69% return, which indicated a real interest in this subject The data received were entered on forms, designed for this purpose, and divided into five groups on the basis of the population of the communities served. No attempt has been made to draw conclusions from the data assembled

This is a compilation of data received and presented herewith, with the hope that it will prove useful to operators who may be contemplating a change in methods or for the purpose of comparison. Of those replying 19 were private companies, 81 water departments, 26 public works departments, 27 water districts and 1 was a metropolitan district, and by population groups the replies were divided as follows:

Under 10,000, 67; 10,000 to 25,000, 47; 25,000 to 50,000, 20; 50,000 to 100,000, 9; 100,000 and over, 12.

Question #2: Kind of pipe used for ordinary services?

Copper tubing	132	
Wrought iron	9	
Galvanized iron	4	
Wrought iron or galvanized C. L.	41	
Other	10	(lead, plastic, brass)

Question #3: What size pipe ordinarily used for single dwelling?

¾"	125
1"	28

Question #4: Average price per linear foot charged.

Question #5: Average cost per linear foot.

The replies to these two questions will be considered together.

38 — Replied that the charge was less than cost
15 — Replied that the charge was more than cost
29 — Replied that the charge was the same as cost
14 — No charge.

Of the private companies replying, 8 charge for service and 6 do not. Methods of charging vary considerably; some charge by the linear foot, some by flat charge, others cost or cost plus, as follows:

	Per lin. foot	Flat charge	Cost	Cost plus
Population up to 25,000	60	8	12	3
Population over 25,000	13	5	3	3

The average charge per linear foot was $1.11. The flat charges varied from $10.00 to $75.00, with an average of $41.00.

Question #6: If overhead is figured in questions 4 and 5, how is it figured?
There were only 34 replies; the average was between 10 and 25%, with one 2%, one 30% and one 50%.

Question #7: Is bill paid before water is turned on?
Majority "Yes".

Question #8: Is pipe laid in trench with sewer and/or other utilities?

Yes	70
No	81

Question #9: Do you have regulations, either local or state, prohibiting the installing of water pipes in the same trench as other utilities?

Yes	52
No	81

Question #10: Is charge made for work in street?

Yes	74
No	71

Question #11: Is charge made for off-street work?

Yes	84
No	20

Question #12: Is a pipe puller used?

For new services	Yes	32	No	109
For relays	Yes	50	No	91

Question #13: Resurfacing done by:

Private Company	23
Water Department	61
Highway Department	62
Contractor	28

Question #14: Do you do all excavating from main to building?

Yes	53
No	100

Question #15: If not, how much?

To property line	50
To curb stop	22

Question #16: Is charge for street work figured by using actual length or is it figured from center line?

Only 9 reported figuring from center line.

Question #17: Are services laid to vacant lots on new streets when main is laid, to save future cuts in pavement?

Yes	48
No	105

If not, would it be desirable?

Yes	54
No	94

Question #18: Is a charge made for relaying old services?

In the street	Yes	53	No	85
Off the street	Yes	101	No	50

Question #19: Is more than one primary meter ever used on a service?

80% reported in the negative.

Question #20: How are mains financed in new developments?

1. 5 to 10% guarantee	41
2. City or town pays	27
3. Developer pays all	55
4. Charge from $2.35 to $3.28 per foot	2
5. Developer labor; city materials	5
6. Company pays	3
7. Developer reimbursed	7
8. Developer and city each pays half	2
9. No policy	11

Question #21: How are mains financed on accepted streets?

1. 5 to 10% guarantee	53
2. City or town pays	73
3. Charge from $2.35 to $3.28 per foot	1
4. Company pays	6
5. Developer reimbursed	4
6. Developer and city each pays half	1
7. No policy	5
8. Betterment assessments	1

Question #22: Should mains in new developments be financed the same way streets and sewers sometimes are, by levying betterment assessments?

Yes	40
No	34

Question #23: What agency assigns location of mains in public way?

Engineering or public works department	36
Water Department	51
Water Company	11
District	4

Question #24: Hourly wage rates.

	Foreman			Skilled laborer			Laborer		
	Max.	Min.	Aver.	Max.	Min.	Aver.	Max.	Min.	Aver.
Under 10,000	2.37	1.10	1.52	1.75	1.00	1.35	1.55	0.75	1.17
10,000 to 25,000	2.75	1.30	1.67	1.95	1.00	1.45	1.50	0.98	1.24
25,000 to 50,000	1.85	1.25	1.67	1.65	1.15	1.44	1.52	1.06	1.27
50,000 to 100,000	1.80	1.44	1.68	1.58	1.22	1.47	1.52	1.16	1.37
Over 100,000	2.07	1.50	1.82	1.83	1.20	1.46	1.64	1.07	1.29

The policies followed in paying overtime were as follows:

1	Paid double time
69	Time and a half
26	Straight time
10	Do not pay overtime
1	Gives time off

The Committee wishes to thank the members for their coöperation and promptness in returning the questionnaires.

Respectfully submitted,

THEODORE L. BRISTOL
JOHN P. HENNINGS
FRED P. STRADLING
JAMES A. SWEENEY
(*Signed*) KENNETH W. ROBIE, *Chairman*

September, 1953

REPORT OF THE COMMITTEE ON PUBLICITY

September 23, 1953

To the New England Water Works Association:

This is the first report of the Committee on Publicity relative to the publicity program of the Association for the past year. The Executive Committee approved the recommendation of the Committee on Publicity relative to retaining a publicity agent on a part-time basis and, as a result, Mr. Sidney B. Shear was retained to cover all of the meetings of the past year and to prepare news releases on the subject matters presented by the various speakers of these meetings. Mr. Shear has also prepared a report on his activities for the year, which is submitted along with this report. The recommendations made by Mr. Shear have considerable merit and the Committee feels that more time should be given for their study and report at a later date.

The coverage given to the meetings held in Boston has not been particularly favorable. The results of a survey have indicated that very little coverage has taken place in the home-town papers of the speakers at these meetings. The news coverage for the meetings held outside of Boston has been ample and well handled by the newspapers of the particular city or town in which the meetings took place.

It is the recommendation of this Committee that a minimum of newspaper coverage should be retained for the good of the members of the Association. The importance of placing the individual waterworks official in the news in his home-town paper should be the responsibility of our Association. It is, therefore, recommended that a part-time publicity agent be retained to cover the Boston meetings, for the purpose of preparing news releases on the subjects discussed at these meetings.

Respectfully submitted,
(*Signed*) PETER C. KARALEKAS, *Chairman*

REPORT OF COMMITTEE ON RECREATIONAL USE OF PUBLIC WATER SUPPLIES

To the New England Water Works Association:

Recreation is on the increase. We are all keenly aware of its magnitude. It is "big business" today. Every body of water is attracting attention as a potential recreational area. And this does not exclude ponds and lakes that are used for water supplies. The number of people who are taking part in recreational activity is so great that they are "spilling over" into our water supplies.

How have recreational interests obtained some use of our supplies? There have, no doubt, been some modifications of our tight control of supplies by Engineers, because of self-evident reasons, but primarily it has been through political expediency, or Court action, and because each man or department has had to tackle the problem alone.

We also have a variable degree of concern as to the danger of the encroachment of recreation on our supplies. The concern is slight where the demands are light and where the legislation seems adequate. However, witness the high degree of concern in areas where Court action has won for the proponents of recreation some use of our supplies and legislative grant of powers has proven inadequate. And remember that Court decrees are based on legal precedent, which makes the decision in every case of importance to every one of us.

From the turn of the century up until recent years we have had a public as well as a professional demand for exclusion of recreation on our water supplies.

Professionally, all the available sanitary information indicates a very favorable health situation, as far as the transmission of disease by water supplies is concerned. However, there are numerous Sanitary Engineers who point out that we still have reservoirs of infection that can be explosive. (And can we entirely predicate the future in the bacterial world on the basis of identified pathogens that we have now under control?) We recall Arthur D. Weston's paper, "Sanitary Protection of Watersheds—Are We Overdoing or Underdoing It?", in the September, 1951, issue of the N.E.W.W.A. JOURNAL. The con-

clusion is one of modification of our exclusion principle, and for all intents or purposes we can use this period as our turning-point to modification. William W. Brush in his July, 1953, editorial in "Water Works Engineering" recognizes the trend as inevitable and calls for close control of any modification; the power and responsibility to be placed in the hands of professional Engineers of the State Health Departments.

A majority of the public still quietly wants a water supply with a minimum of human activity on it. But we also have an active organized minority, which may not hesitate to exploit our very favorable health position in their request for nearly unrestricted use of our supplies.

We recognize that each supply problem is an individual one. However, we can not afford to ignore the value of common concern. Why? Court decrees, up until recently, dealing with the use or pollution of water supplies have been very emphatic in their statement of principle that "innocence is better than repentance".

In 1952 at Manchester, N. H., the Superior Court completely ignored that principle and decreed against the New Hampshire State Board of Health's decision to close part of Manchester's water supply to all use. The plaintiff's legal counsel in developing background for the Court made reference to the Illinois case of People vs. Bowen, 376 Ill. 317, 33 N. E. (2nd) 587, 589. The Court allowed the plaintiffs in the Manchester case findings that are equally as damaging as the Illinois case. This New Hampshire decision can, and perhaps will, affect every water supply represented here.

The Committee may vary somewhat in general opinions on recreational use of supplies. We previously mentioned the degree of concern. However, we emphasize that each member agreed in essence that there was some limit to recreational use of supplies. What are the limits? How far can we go? Can we substitute proof for prevention? By our suggestion of modification we tend to admit our safety factor is now greater than necessary. But how much too great? The "expert" in one Court case stated that the chlorination being practiced would go "far beyond" the pollution the water supply was receiving. How much is "far"? And if that raw supply received a far greater amount of pollution and had a chlorination failure, would there

be danger to health? Schwartz of M.D.C. has demonstrated that bacteria can clear the chlorination point imbedded in algae. Is this significant in light of the fact that "experts" may be willing to crowd the safety factors of chlorination?

This is not an argument against modification where, in the light of complete sanitary surveys by responsible Boards of Engineers, it is decided that it is safe to allow recreational activity, but rather a call to a complete study of the problem, in that we may present a uniform stand on the issue and that we may guide the recreational problem to a capable and responsible body for control, and that we may gain the support of the public and of the recreational interests for our sound approach to the problem.

Respectfully submitted,

(*Signed*) CLARENCE L. AHLGREN, *Chairman*

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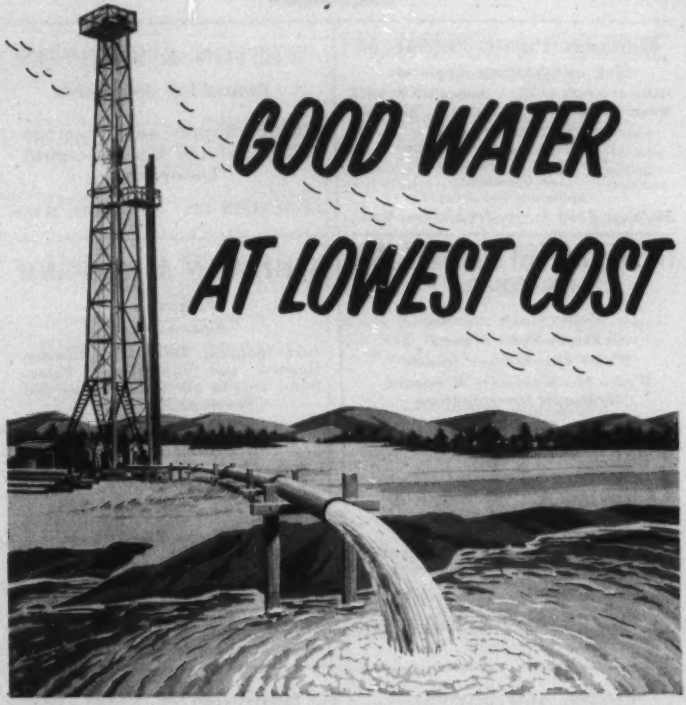

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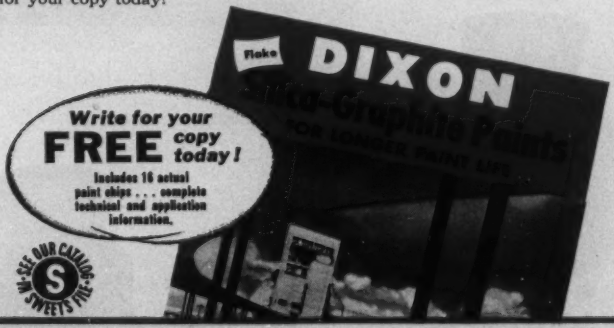
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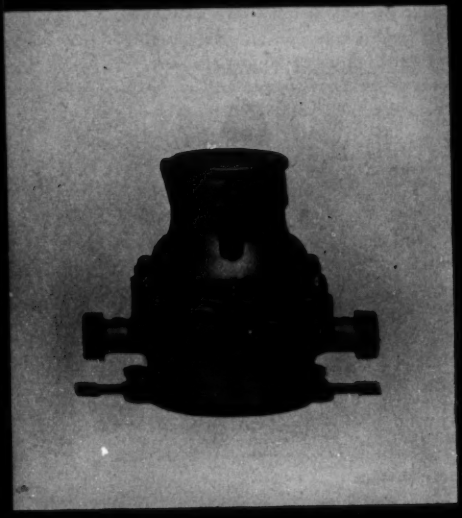

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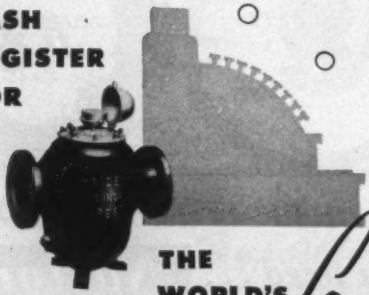

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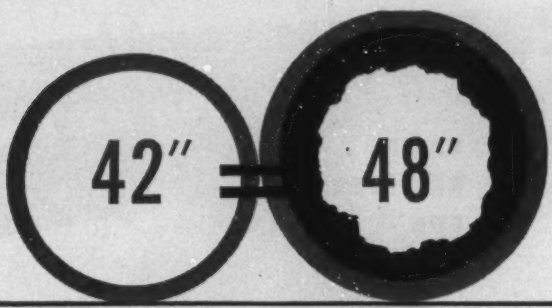

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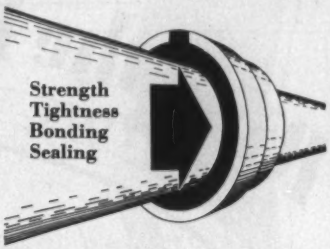

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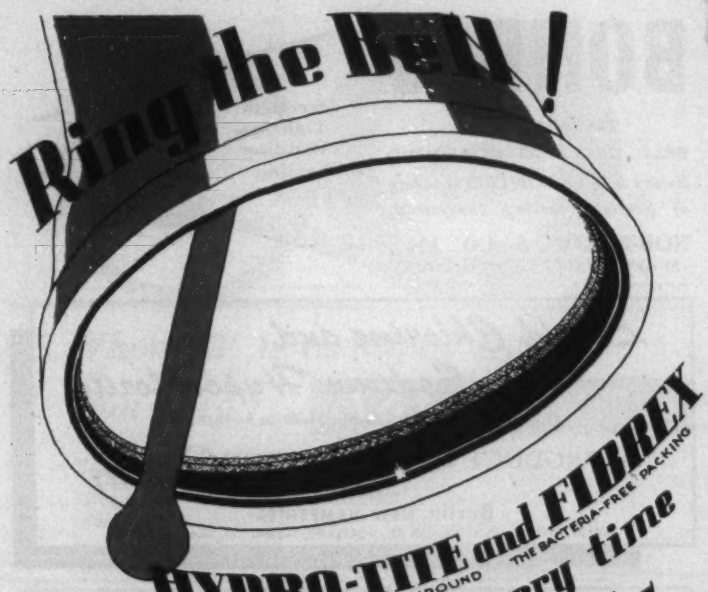

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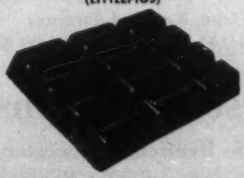

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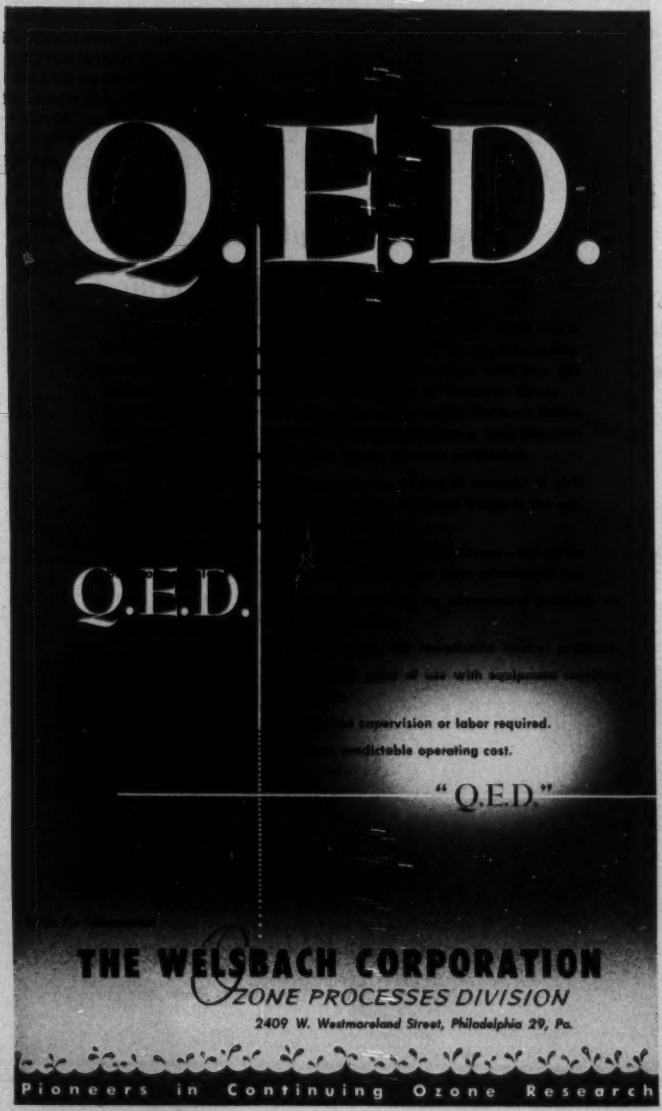
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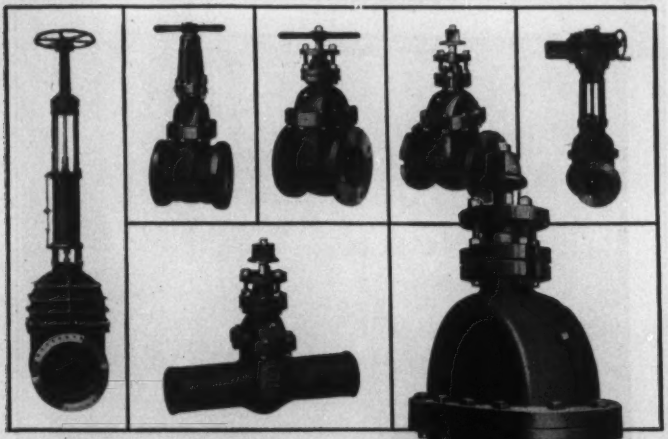

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WRITE FOR BULLETIN 106

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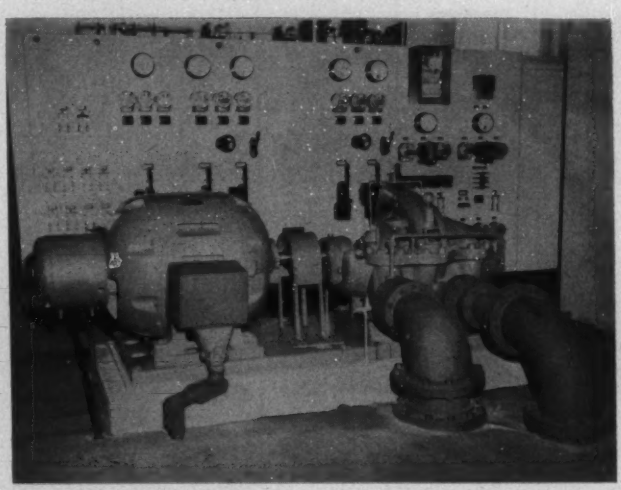

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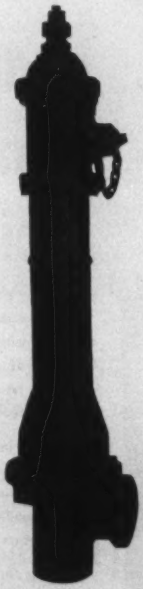

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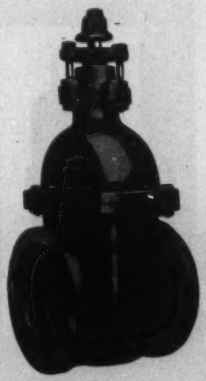

Besides valves and hydrants to meet the most exacting demands of waterworks service, the complete EDDY Line includes: valves for sewage disposal works; valves for steam, gas and oil; check valves, foot valves, plug valves, shear gates, indicator posts, etc. EDDY valves are made in three classes: Iron Body Bronze Mounted, All Bronze, and All Iron Valves.

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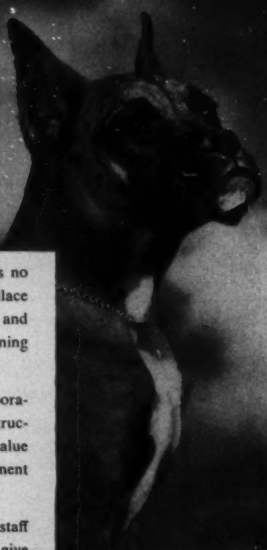
Eddy Valve Co.

WATERFORD NEW YORK

pedigree is no accident...



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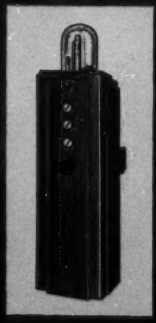

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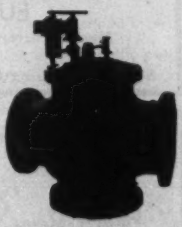

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